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ELECTRICAL ENGINEERING IN ENGLAND.

During the present year vast strides have been made towards the establishment of centres of technical instruction in what must now be looked upon as the absorbing topic of the day. Although previous to this there were many places where students might acquire a good knowledge of electrical work, amongst other subjects, we think we may say without fear of contradiction that two years since there were not more *special* classes or schools of instruction in matters electrical than could be counted on the fingers of one hand. Now it would require a little thought to enumerate the manifold centres of education where technical instruction in electrical engineering is made a speciality. Beginning with London, we may at once say that we do not know of a more suitable place for a student to acquire that which is not always sufficiently taken into consideration in many technical classes, viz., an elementary knowledge of electricity and magnetism, than by a course of study in the classes of the Birkbeck Literary and Scientific Institute. Many of our younger and well-known electricians have, to our knowledge, gained much valuable information by the good and patient teaching, and the numberless experiments performed before the students of these classes by Mr. Wilson and his assistants. Then we have, amongst others devoted to the complete education of an electrical engineer, the School of Telegraphy and Electrical Engineering, which has, perhaps, been established a greater number of years than any others of an important character.

Better known than all, and probably more fully attended, are the classes of the City and Guilds of London Institute. We have now before us a programme of the technological examinations (1882-83) of this college, together with the papers set in the examination for 1882, which form a very interesting study; and if the questions herein set had been correctly, or even fairly, answered by the students under examination, the result would have shown great proficiency in the pupil and teaching ability which does not fall to the lot of all professors of science, for oftentimes a clever scientist may fail utterly in the endeavour to explain his views to others. We are under the impression, however, that the questions dealing with electrical matters did not show any extraordinary acquirements on the part of the pupils generally, and we are inclined to think that this may be due partly to the want of the elementary knowledge of electricity and magnetism as a starting-point, and partly to the fact that professors of deep learning in the subjects they teach may not be able to descend sufficiently into a simple and forcible way of addressing a mixed assemblage so as to enable them to convey clearly and indelibly their lectures to their hearers. At King's College, Prof. W. Grylls Adams has established special classes for instruction in electrical engineering, which will doubtless be taken full advantage of. It may not be out of place here to mention that Mr. St. George Lane-Fox, one of the most successful inventors in "electric lighting," was formerly a pupil of Prof. Adams. The "Hammond" College, which has recently been opened, will also be of considerable service in the cause of electrical science, but its operations will be limited to the supply of competent electricians to the "Hammond" Electric Light Company and its off-shoots. In the country, instruction equal to that obtainable in the metropolis is provided in several towns. Bristol and Glasgow have each its university and classes presided over respectively by Prof. Silvanus Thompson and Mr. Andrew Jamieson, C.E., and both gentlemen are well known in connection with the latest developments of electrical engineering.

Manchester, following the example of these towns, comes prominently forward with the Owens College classes, conducted by Prof. Arthur Schuster and Mr. W. H. Gee. Until recently the impression that the profession of an electrician did not offer much attraction, and that it was already overdone, had a deal of truth in it, but this is no longer the case. The demand for competent men is at present certainly greater than the supply, and electrical may now be compared to railway, engineering, in its early days. Never did a subject present greater attractions and inducements to the student than that on which we have made these observations, and we have little doubt but that the centres of instruction we have alluded to will have their resources severely taxed. We notice in the Report of the City and Guilds of London Institute that "any person desiring to form a class for instruction in any technological subject, with a view to these examinations, should apply, as early as possible, stating his qualifications, to the Director and Secretary of the Institute, Gresham College, E.C."

We are not aware whether such classes as exist at the Birkbeck are to be found in the school of the City and Guilds Institute, but if not it would surely be worth while to start such classes as an introduction to the more advanced studies taught by Prof. Ayrton and others.

ELECTRICAL APPARATUS FOR STOPPING STEAM ENGINES.

At the beginning of the week we paid a visit to the offices of Messrs. Duncan Bros., engineers, of 32, Queen Victoria Street, for the purpose of inspecting Tate's patent electric valve-closing apparatus. As will be readily surmised, the object of the invention is to automatically close the valve of a steam-engine, and therefore stop it; and to do this in the quickest possible manner the inventor has had recourse to a very simple electrical expedient.

We cannot do better than use nearly the same description of the apparatus as that given by Messrs. Duncan Bros.

The apparatus is shown in fig. 1, and consists of an ordinary Leclanché battery (two cells), not given in the drawing, an electro-magnet, and wires leading to any position from which it may be desirable to control the engine, and press buttons for completing the circuit. Also a small steam cylinder, piston, and rack and pinion gearing, which actuates the stop valve on the engine.

The electro-magnet is placed at the top and connected, as may be seen more plainly in fig. 2, to a suspension rod which actuates a small steam cock on the cylinder of the apparatus. When it is desired to put the apparatus in operation, the pressure of the finger on one of the buttons —at any distance from the engine—closes the circuit,

excites the electro-magnet, and causes it to lift its armature and release the suspension rod, which falls with a velocity due to its own weight. The suspension rod in falling opens the small cock on the cylinder and admits steam, the initial pressure of steam being the same as in the steam-engine cylinder. The piston in the cylinder of the apparatus immediately ascends and the rack piston rod instantly closes the engine stop valve.

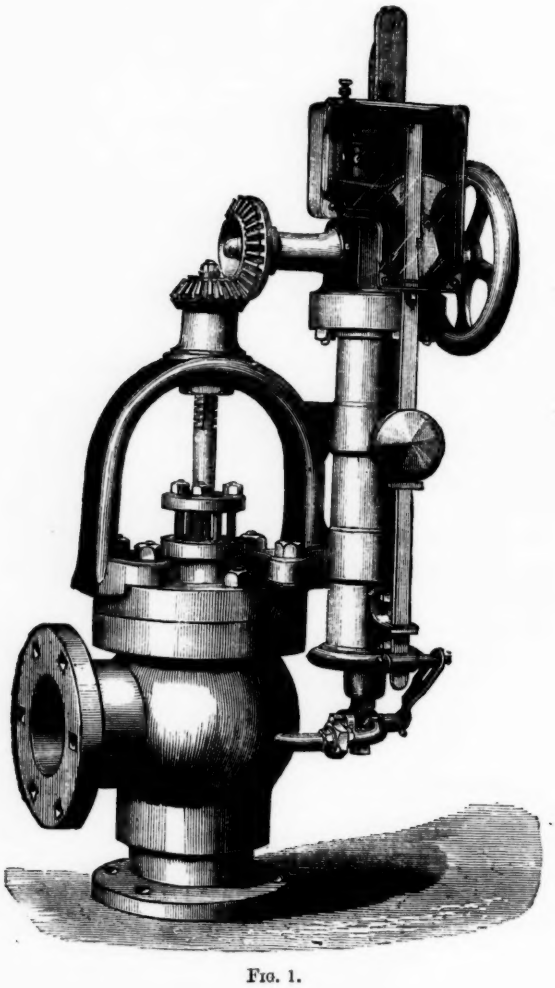

Fig. 1.

The steam to work the apparatus being taken from the stop valve chamber from underneath the valve—*i. e.*, between the valve and the steam-engine cylinder—the consequence is that as soon as the stop valve has been closed there is no longer any pressure in the small cylinder; and when it is desired to start the engine, the engine-driver has simply to lift up the suspension rod to its normal position and open the stop valve in the ordinary way. In lifting the suspension rod the small cylinder cock is again closed against the admission of steam, but the cock having three passages is opened for the inlet of atmospheric air. The act of opening the stop valve by the hand wheel operates also on the piston, which falls to the lower end of the small cylinder and is then reset for further use.

When applied to the stop valves of condensing engines, a cock fitted on a pipe opening to the atmosphere is also actuated by the apparatus, and at the instant the stop valve is closed this cock is opened, thus admitting air into the condenser, destroying the vacuum and stopping the supply of water.

The apparatus also stops the engine on which it is fitted whenever the speed exceeds the ordinary rate by any given number of revolutions. This is effected by means of the throttle, or variable expansion valves, actuated by the engine governor. Short arms are fixed on the valve spindles which act as fingers to press in a push or button at any time the valve exceeds the usual range of lift or stroke.

By looking at fig. 2 the action of the apparatus will be much more clearly seen. The suspension rod, E, is held in position by the tooth in the locking-piece, D. The cam-shaped piece, C, is kept back by the end of the armature, A, which is lifted when a current is passed through the electro-magnet, M. When this occurs, C falls over by its own weight, and striking a projection on the back of D, knocks this locking-piece away, and the suspension rod thereupon falls and performs the operation assigned to it. As far as the parts of the apparatus directly actuated by the electric current are concerned, they are of the most simple character, and there is apparently nothing liable to get out of order. It is oftentimes very important that engines shall be quickly stopped, and we cannot conceive a more simple or more effectual way than that devised by Mr. Tate. It is stated that this invention "brings within the reach of any person

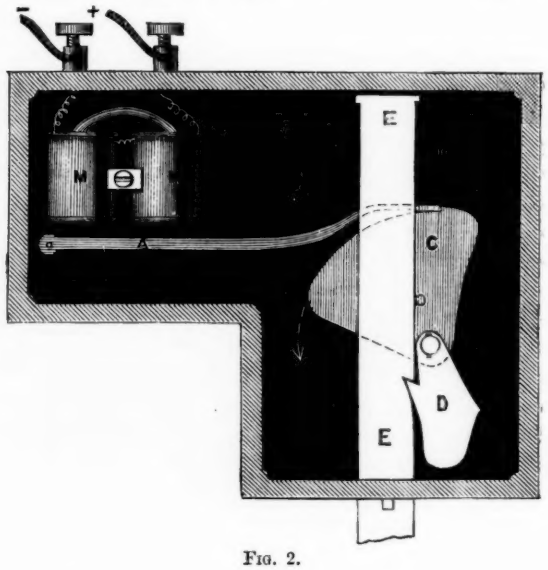

Fig. 2.

on board ship the power of stopping the engines at a moment's notice, and thus averting the dangers of accidents due to collisions and grounding. On every deck and in every compartment of the ship, buttons can be placed (protected by glass covers), communicating with the electric battery, which by means of an electro-magnet actuates the valve-closing motion." This wholesale arrangement of press buttons, however, would be a doubtful advantage, for any persons inclined to be mischievous might do more damage than the invention is intended to obviate. However, we take pleasure in bringing to the notice of our readers an apparatus at once so simple and useful, and we feel sure that its numberless advantages will be apparent to all, without any further explanations from us.

THE MANUFACTURE OF SUBMARINE CABLES.

Up to the present time it may be said that the manufacture of submarine cables has been entirely confined to England, and for years to come we may maintain our supremacy in this kind of electrical engineering; but there are not wanting indications, which although now but faint, appear to point to competition at some future date from another country. Our readers have doubtless perused in our "Notes" columns an account of the cable recently laid by the Baltimore and Ohio Telegraph Company across the Narrows at the entrance of New York Harbour. Although this was but 2,200 yards in length, diameter $2\frac{1}{4}$ inches, and weight 3,600 pounds, certainly insignificant enough when looked at from one point of view, but very suggestive from others, it shows, in combination with several minor matters of the same character, that our American cousins have seriously at heart the development of cable manufacturing in their own country.

Indeed it is surprising that such an undertaking should have been so long delayed in that part of the world where everything else connected with electrical science is carried on with such energy. A writer in the *Montreal Gazette* says in an article on the successful completion of the submersion of the Central and South American Telegraph Company's cables:—"Our American cousins show their good sense by purchasing from our common parent what they cannot produce themselves." The author of this remark certainly does not flatter his neighbours, but we fancy he is not far from the truth nevertheless. Cable work is quite unlike any other kind of industry, and our monopoly of this branch of electrical engineering is the result of dearly bought experience. It has been brought to such a state of perfection here, that it would scarcely be a profitable venture to start cable making manufactories on a large scale in America or any other country, unless it was a branch establishment of an English company, such as that of Persan-Beaumont, France, which is an extension of the India-rubber, Gutta-percha, and Telegraph Works Company.

It is necessary to consider that in the existing English factories the cable-making machinery of the present day is much the same as that which was in use long ago with but slight modifications, and therefore its first cost may be looked upon as having practically vanished, and need not be taken into account in estimating the cost of manufacturing a new cable, as would necessarily be the case if a foreign competitor entered the field with everything entirely fresh. What applies to the cable works may be also considered in regard to the cable ships. The constant practice and experience of English manufacturers enables them to complete any lengths of submarine cable in the shortest possible time and at the smallest possible cost. But this is not all. It is necessary that the cable shall be both mechanically and electrically perfectly sound, and such conditions can only be obtained by the aid of skilled electricians, who have spent a number of years in carefully watching the various points, electrical and mechanical, which go to ensure the perfection of a completed cable. This portion of the contract can be successfully performed by the staff on shore; but the most difficult performance of all has yet to come. The submersion of long cables taxes the ability of electricians and submarine telegraph engineers in the highest degree, for to lay a long cable from shore to shore without any hitch or fault occurring either in its mechanical or electrical conditions is a feat, the successful accomplishment of which may well be regarded as an achievement to be remembered with pride.

Had a fault occurred in the short American cable of which we have spoken, or had it been lost altogether, it would have been a matter of small moment; but conditions are entirely altered in these respects when we have to deal with lengths of 1,000 and 2,000 knots. We need not comment upon the result of a fault breaking out in such lengths as these. In every detail of cable manufacturing we have the lead of all other countries, and it would assuredly take many years for America to compare with us even in manufacture; and as our contractors have the confidence of the entire world, we must conclude that the chief construction of submarine cables will always be held by England. It is only necessary to point to the latest exploit of the India-rubber and Gutta-percha Company to show the perfection which has now been attained in cable work, from the preliminary survey of the course and ocean's bed to the complete submersion of the cable. Mr. Robert Gray, the company's engineer-in-chief, is to be congratulated on the successful finish of a great undertaking, and also on the ability and skill of his assistant electricians. The laying of the Central and South American Company's cables has still further increased the Silvertown Company's reputation, and it is not perhaps too much to say that never was an undertaking of such magnitude carried out with fewer drawbacks. We have kept our readers well informed concerning this most interesting expedition, and we hope to place before them at the proper time an exhaustive account of the entire proceedings.

A New Cable.—According to the *Times* of the 17th inst., a new submarine cable will shortly be laid between France and Senegal.

KERNER'S BURGLAR ALARM EXCHANGE SYSTEM.

The use of electricity for domestic purposes is much greater in America than in this country; in fact the progress which has been made in England has practically been nothing to speak of. Even the use of electrical fire alarms has only been effected under great difficulties, and the encouragement which this form of apparatus has received has not been by any means great. Simple forms of electrical burglar alarms, although mentioned in the catalogues of every electric bell manufacturer, have practically never come into use; whilst the more elaborate applications of this form of signalling apparatus, which are to a considerable extent employed in the United States, are never dreamt of for use in any English town. Possibly now that electricity is coming so prominently into public notice some of its applications to domestic purposes may receive more attention than has hitherto been the case, and we think that its application for the protection of property should receive careful consideration.

The American Kerner Electric Burglar Alarm Company have closed a contract with the District Telephone Company of New York for the right to use this system in New York and Brooklyn, and this recent adoption is made after exhaustive trials of other systems, which have proved total failures in one way or another.

In selecting a system for any purpose, the one that has been most carefully worked out in all its details and which appears most likely to best answer the purpose required, should be the one selected for practical use. In describing the system which Mr. Marion Harrison Kerner has devised for the protection of property from burglarious attempts, we think that we are bringing to notice a system which has been most carefully considered and which can effect all that is claimed for it. By this system a bank vault, warehouse, shop, residence, safe, or any property, movable or immovable, may be made thoroughly burglarproof in the following manner:—

1. Bank Vaults.

The interior walls of the vault are arranged with a system of conductors, either of tinfoil or sheet-copper in such a manner that any attempt to penetrate them with any kind of tool will disturb the circuit and cause an alarm to be rung at a central station or exchange where a staff of servants is held in readiness to respond thereto. There is no alarm whatever sounded at the bank, and no indication made to the burglar that he has unknowingly alarmed the central station, and so he proceeds in his project until surrounded and captured in his depredatory act.

The entrance to the vault is arranged with a duplicate door of any design, constructed of wood and paper and arranged with invisible electric conductors and appliances for carrying a current of electricity through them when closed, so that the door cannot be opened or cut through, nor any portion of the vault entered without an alarm being instantly given at the central station or exchange.

2. Safes.

In the case of jewellers' safes or, in fact, any kind of safe, a cabinet of any desirable design is constructed and placed around the safe, and this is done in such a way as to make it an ornament to the room. The cabinet may be constructed as follows: The frame work is of any kind of wood, and the panels may be either of wood or paper to match. The framework is protected by wires imbedded in the wood, and leading thence to the panels, which are lined with either tinfoil or copper strips, these last being electric conductors. So it will be observed that any attempt to tamper with the safe immediately sounds an alarm at the central station before even the safe has been reached.

3. Warehouses.

In warehouses the walls are arranged with the foil or copper strips or copper wire as the case may require, which are covered with paper to match the rest of the premises. The windows are arranged with springs to prevent their being raised without sounding the alarm, and wherever it is required a light wooden screen is inserted in the window at night, and this screen is connected by a system of springs to the general circuit, and cannot be cut through or removed without giving the alarm.

4. Residences.

There are many systems of electric burglar alarms used in the protection of private residences, most, if not all, of which the inventor is familar with.

In all exchange systems where more than one subscriber is on a circuit, there is absolutely no protection afforded to any of them, for the reason that the circuit may be cut at any point, and the place cannot be located, from the fact that there is no current on the line at all ; and furthermore, an indefinite amount of resistance may be put in at any point, the indication of which upon the galvanometer in the central station depended upon for the location of the trouble will confuse the operator in charge, and give him absolutely no correct indication of the locality of the fault.

It has proved feasible to maintain several stations on one wire for fire alarm purposes, but in the United States burglar alarm systems of this kind have been entirely discarded for the individual line exchange system, as the only plan guaranteeing complete protection against burglars.

The plan of conducting the burglar alarm business is as follows :—An office is located in some convenient centre, from which wires are carried to the various structures to be protected. At the central station a man is constantly on watch, while a force of extra or special men are quartered in an adjoining room, or within easy calling distance of the watchman. Immediately on receiving an alarm from any of the protected premises, which are indicated by an annunciator in the usual way, the staff of specials is aroused, and at once securing the services of the police, they proceed to the point from which the alarm emanates, and are in readiness to pounce upon the burglar and surprise him when he leaves the premises.

The inventor, Mr. M. H. Kerner, has been nearly 30 years in the telegraph business in America, and for the past eight years has devoted his entire time and talents to the improvement of protective systems of burglar alarms. He first took hold of an old and at the time a crude system, and by the introduction of essential improvements made a marked success of it. But still there remained many objections and imperfections to be remedied in order to ensure absolute certainty of action in time of its use, and he devoted himself to the construction of an entirely new apparatus, utterly devoid of the faults contained in the first, and he has now secured what is said to be the most perfect system of burglar alarms devised up to the present moment.

As regards the general working of the system, on the first of each week a report is sent, sealed, to the subscriber, showing the time that his store, safe, or warehouse (as the case may be) was closed, and the exact time that it was opened each day. Should the employé return for any cause whatever, that time is also noted by signal and the name of the employé recorded, as indeed are any irregular openings for whatever cause noted, and a full report of the entire week's doings sent to the employer (subscriber). In all irregular openings a special report is sent to the subscriber next morning.

There are usually two men in the central office on duty, one ready to immediately go to the place of alarm, and the other to rouse the men asleep or resting. The first one secures the assistance of the police, and the other men follow on to the place where the signal came from.

In the central office there is a watchman's clock, to "check" the man on duty there ; and it is a part of his duty to record the standing of the galvanometer needles connected to the instruments every fifteen minutes during the entire night. He examines the instruments and makes a record of the standing of the needles, so that any variation in the current of electricity, whether atmospheric or otherwise, is noted on the record, and steps are at once taken to remedy it.

In the inside of a warehouse traps are frequently connected with the counters and shelves, and sometimes with inside doors, so that in case a burglar secretes himself within a building during the day, he can hardly tamper with any wires without the alarm being sounded.

A system of springs is placed on the counters and shelves, and the goods are placed on these springs, so that the moment they are shifted the alarm is sounded.

For people who require a place of great security, for such valuables as diamonds, jewels, gloves, ostrich feathers, furs, laces, &c., it is not unusual to build cabinets of pine wood, and these are protected by springs, &c.

Arrangement of Signals.

An arrangement is made with the subscriber as to the proper time for his warehouse or safe, or both (as the case may be), to be opened in the morning, and a system of signals is arranged so that the central office may know that a person in authority has opened the same. But these signals are not accepted at an hour earlier to that arranged for between the central office and the subscriber, and, therefore, should the employé who carries the keys be overpowered on his way to business by burglars and the keys taken from him, and the burglars enter the place even after the usual hour of opening, unless the central office receives a correct signal a force is at once sent down to ascertain the reason.

The signals may be changed as often as desirable, and like the combination lock of a safe, they are unknown to any except those immediately interested.

Usually there are more persons than one who have to do with the signalling, but as each individual has a different signal it is easily known who signals. No one is allowed to know another's signals.

It is customary when an employé is discharged to change all the signals, so as to guard against the dismissed employé knowing the other signals.

In order to circumvent the designs and ingenuity of burglars, many devices and precautions are taken and every protection desired can be afforded by this system.

One of the advantages of this "Kerner" system over others is, that the central office has control of the circuit or line by day as well as by night, so that should the line be disturbed, cut, or crossed, the central office is immediately alarmed, and the line is repaired before the subscriber closes his place

By the old system it frequently happened that a subscriber could not communicate with the central office, because the line having been cut or crossed in some place the defect would only be discovered after the store was closed by notification from the subscriber per messenger.

Kerner's system controls the entire system during the day as well as the night with the system of the open attachments, therefore if a defect occurs anywhere in the central circuit the central office is notified by signal and a man is at once sent to locate and remedy the trouble during the day. By the old system the defect could not be remedied till next day, and this would necessitate a watchman being kept on the premises all night.

By the Kerner system, no matter at what portion of the building an entrance is effected, the alarm sounds and immediate action is taken. Whereas, where there is simply a watchman over the building he can only guard that portion immediately under his view, and thus while he was protecting and watching on the north or west side an entrance could be effected by the burglar at the south or east side of the building.

The general principle of the apparatus will be understood by reference to fig. 1. The portion of the apparatus shown to the left of the "line wire" represents the instruments placed at the central station. M, M^1, are two electro-magnets, of which M is wound to a lower resistance than M^1, so that it requires a proportionately stronger current to actuate it. The battery, B, under ordinary conditions, sends out a permanent current to line ; this current flows through the bell, B^1, thence through the line, L, L, 7, the resistance, R, the wire, 8, to terminal, 9, of the switch, S^1. Under ordinary circumstances, that is to say, when every portion of the building fitted with the apparatus requires to be protected, the bars of the switch are turned over to the *right*, under these conditions the current flowing from line 8 passes through switch-bar, S^2, to wire 10, thence to wire 11, wire 12, wire 13, to terminal 14, from the latter the circuit is completed through switch-bar, S^3, to earth.

Now the resistance, R, is so adjusted that the current flowing through the magnets, M, M^1, is of such a strength as to cause the armature of magnet, M^1, to be attracted only, that of magnet, M, remaining unaffected. Under these conditions the circuit of the local battery, *e*, through the electro-magnet, *a*, of the drop indicator, A, remains open since the two armature levers are both away from their respective contact stops. If now by any cause the circuit of the line wire is broken, the armature of electro-magnet, M^1, falls back against its contact stop, and by closing the

circuit causes the indicator, A, to give a signal. Again, if the line wire should become put to earth the current passing through the electro-magnets will be increased, and the armature of M, being attracted against its contact stop, will close the local circuit and cause the drop of indicator, A, to fall. We thus see that either a disconnection or an earth will cause a signal to be produced at the central station.

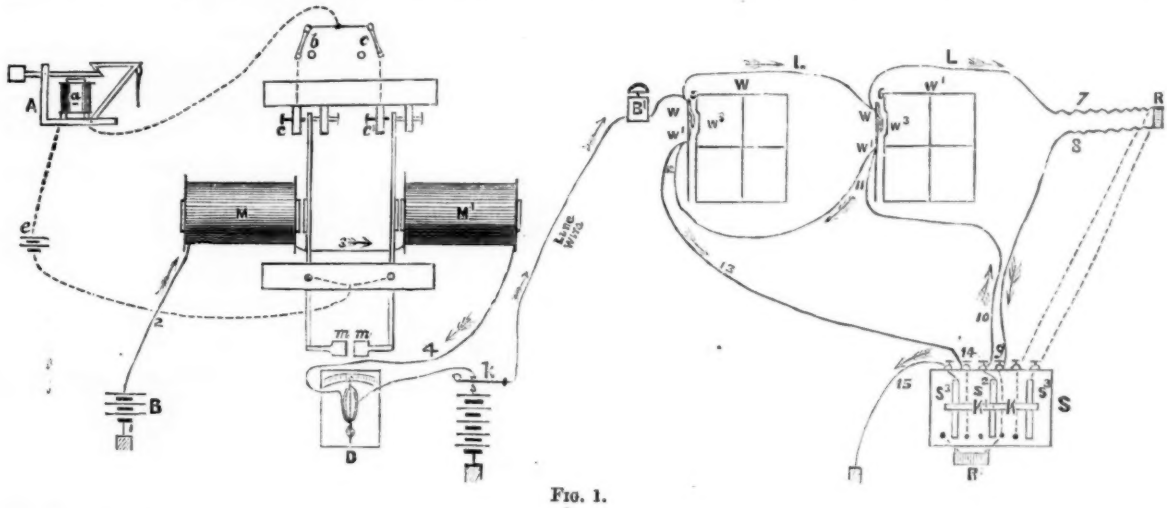

Fig. 1.

W, W', represent two windows or doors which it is desired should give an alarm on being opened. Connected to W, W', are contact springs, *w*, *w'*, which become pressed together when the windows or doors are opened. The effect of this movement of the springs is, it will be seen from the figure, to put the line wire direct to earth through wire 13, terminal 14, switch-bar s^3, and wire 15. Wires 7 and 8, which are shown in the figure as connected to the resistance, R, form part of the circuit of the networks of wires or layers of tinfoil, sheet copper, &c., which are woven into or placed over the doors, panels, &c., which are required to be protected; any attempt to break through the latter will either cause the circuit to be broken or the wires to be put in contact, and thus to cause an alarm to be given.

As it is required that the windows or doors can be opened during the daytime without sending an alarm signal, the switch, S, is provided. When the bars of this switch are moved over to the *left*, then it will be seen that the right-hand switch-bar, s^1, short-circuits the resistance, R, whilst the circuit is completed to earth through the resistance, R_1, and switch-bar, s^3, there being no circuit by means of the spring-contacts of the windows, W, W'.

The resistance, R_1, is of a different value to R, hence the strength of current flowing through the line when the switch-bars are over to the left will be different to that flowing when the bars are over to the right. As these current strengths will be indicated on the galvanometer, D, it is evident that the central station can tell the position of the switch, and, consequently, whether the windows are in connection with the alarm system or not.

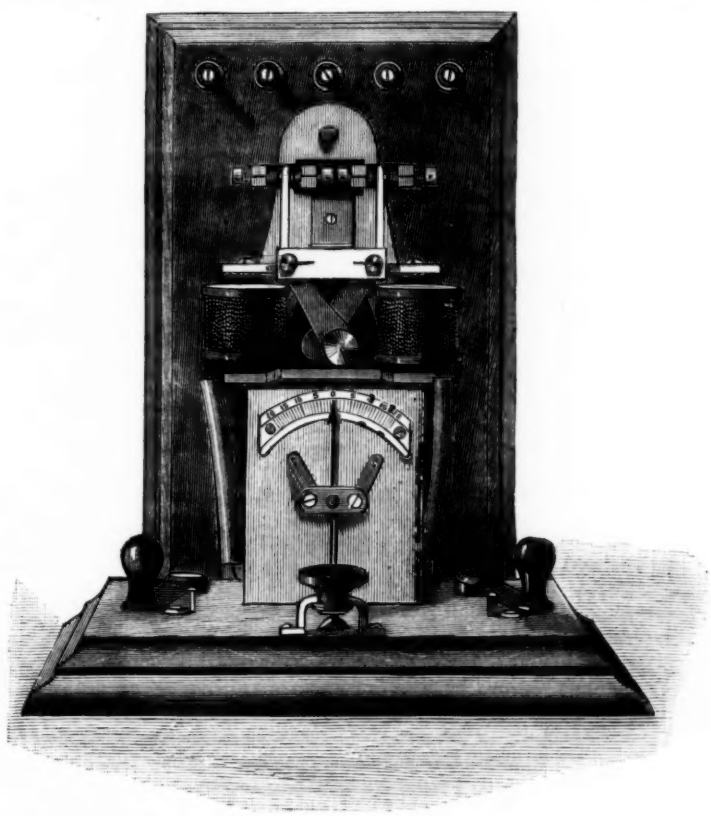

Fig. 2.

According to arrangement it is understood that when the day's work is over at the warehouse, bank, &c., which is protected by the system, the switch is to be turned over to the position which protects the windows and doors, and, as explained, by means of the galvanometer deflection the central station can see that this has been done. When the station attendant perceives that the switch has been turned he depresses a key, *k*, which sends a strong current to line and rings the bell, B¹, thus the movement of the switch is acknowledged and the bank or warehouse knows that everything is in proper working order.

By means of the switches, *b*, *c*, the circuit of the drop indicator, *a*, with either of the armature levers, can be broken if required, so as to stop the ringing of the bell, which may be placed in circuit with the indicator, A. By having two switches it can be seen whether the signal is being given by the line making earth, or from being disconnected.

Fig. 2 shows the actual arrangement of the electro-magnets, M, M¹, the galvanometer, D, &c.

THE INTERNATIONAL ELECTRICAL CONFERENCES.

The delegates attending the conference, relative to the protection of submarine cables, now being held in Paris, assembled on Monday last (after visiting the various ambassadors) at the Bureau des Affaires Etrangères, in the grand reception room, just before vacated by the assembly which met to discuss the "Electrical Units" question.

It is somewhat unfortunate that several of the delegates belong to both conferences, as it appears probable that the progress of the negotiations will be thereby somewhat delayed.

The delegates were received at 3 p.m., and M. Duclerc, the Minister of Foreign Affairs, delivered a speech in which he welcomed them to Paris, at the same time descanting on the importance of the subjects about to be discussed, &c. M. Kern, the Swiss Minister, senior in rank amongst the delegates, replied in a short, complimentary speech, and after thanking M. Duclerc, suggested that M. Cochéry should preside at the meetings. The former gentleman then retired, and M. Cochéry took the chair. In a short oration he pointed out that both conferences could not well assemble on the same days, and the meeting was adjourned till the Wednesday at 2 p.m. The following programme is that sketched out by the French authorities :—

International Conference Concerning the Protection of Submarine Cables.

1st. Protection of Submarine Cables, comprising :—

A. Causes of destruction.
B. Cases in which the destruction is a punishable offence. Cases to which extenuating circumstances may be applied. Cases giving right of indemnity to the owners of ships who shall have, in extreme cases, sacrificed an anchor or a chain in order not to injure a cable.
C. Appointment of officers or agents, who shall have the right to estimate injuries.
D. Designation of competent courts.
E. Penalties.
F. Means of execution.

2nd. Protection of Ships engaged in the laying down and maintenance of Cables, comprising :—

A. Scheme for preventing collisions.
B. Examination of the privileges which it would be possible to allow in favour of ships intended to lay down cables.
C. Conditions necessary to make sure of the protection of the buoys intended to indicate the position of the cables in case of derangement or rupture.
D. Sanction which it is expedient to give to these various schemes.

3rd. Conditions of existence of Cables over each other, comprising :—

A. Examination of the rights of the first occupant.
B. Fixing conditions under which a second cable may be submerged over a first.
C. Rules to be observed in repairing juxtaposed and superposed cables.

List of Powers represented at this Conference.

Governments.	Names of Delegates.
Allemagne	M. le Dr. Dambach, Conseiller intime supérieur des Postes.
	M. Donner, Capitaine de vaisseau en non-activité, Conseiller impérial de Gouvernement.
Autriche-Hongrie	M. le Colonel de Bonn, Attaché militaire à l'Ambassade d'Autriche-Hongrie à Paris.
République Argentine	M. le Colonel Mansilla.
Belgique.....	M. Léopold Orban, Ministre Plénipotentiaire, Directeur des Affaires Politiques au Ministère des Affaires Etrangères de Belgique.
	M. Michel, Inspecteur-Général de la Marine.
Brésil	M. le Vicomte de Nioac, ancien Officier de Marine.
Colombie	M. le Dr. Triana, Consul-Général de Colombie à Paris.
Chine	
Costa-Rica.....	M. Somzée, Premier Secrétaire de la Légation de Costa-Rica à Paris.
Danemark	M. le Comte de Knuth, Secrétaire de la Légation de Danemark à Paris.
	M. Wandel, Capitaine de frégate.
République Dominicaine	M. le Baron d'Almeda, Ministre de la République Dominicaine à Paris.
Espagne	Don Juan Ravina y Castro, Don Lucas Mariano de Tornos y Matamoros, Directeurs de Section de 1ère Classe du Corps des Télégraphes.
Etats-Unis	M. Morton, Ministre des Etats-Unis à Paris.
	M. Vignaud, Secrétaire de la Légation.
France	S. E. M. Cochéry, Ministre des Postes et des Télégraphes, assisté de MM. :
	M. J. B. Dumas, Secrétaire Perpétuel de l'Académie des Sciences, Membre de l'Académie Française.
	M. Clavery, Ministre Plénipotentiaire, Directeur des Affaires Commerciales et Consulaires au Ministère des Affaires Etrangères.
	M. Bergon, Directeur du Matériel et de la Construction au Ministère des Postes et des Télégraphes.
	M. Louis Renault, Professeur à la Faculté de Droit de Paris.
	M. Dupont, Capitaine de frégate.
Grande-Bretagne	M. C. Kennedy, C.B., Directeur du Service Commercial au Foreign Office.
	M. C. H. B. Patey, 3e Secrétaire.
	M. C. Trevor, Secrétaire-adjoint au Board of Trade.
	M. H. Farnall, Attaché au Foreign Office, remplira les fonctions de Secrétaire de la Délégation Anglaise.
Indes Britanniques	M. le Lieutenant-Colonel J. W. Bateman Champain, R.E., Directeur-en-chef du Département du Télégraphe Indo-Européen.
Grèce	M. le Prince Mavrocordato, Ministre de Grèce à Paris.
	M. Timoléon Argyropoulo, Professeur de Physique à l'Ecole Militaire d'Athènes.
Guatémala	M. Crisanto Medina, Ministre du Guatémala à Paris.
Italie	M. Avarna di Gualtieri, Secrétaire de l'Ambassade d'Italie à Paris.
	M. Fedele Salvatori, Inspecteur-Général des Télégraphes.
Japon	M. F. Marshall, Conseiller de la Légation du Japon à Paris.
Mexique.....	M. Velasco, Ministre du Mexique à Paris.
	M. F. Diaz Covarrubias, Ingénieur-Geographe.
Nicaragua.....	M. Baille, répétiteur à l'Ecole Polytechnique.
Norvège.....	M. Nielsen, Directeur-Général des Télégraphes Norvégiens.
Perse	
Pays-Bas	M. Jansen, Capitaine de vaisseau en retraite, Membre du Conseil d'Etat des Pays-Bas.
	M. Asser, Professeur à l'Université d'Amsterdam, jurisconsulte du Département des Affairs Etrangères des Pays-Bas.
Portugal.....	M. d'Azevedo, Chargé d'Affaires du Portugal à Paris.
	M. Robert Edouard Silva, répétiteur à l'Ecole centrale des Arts et Manufactures de Paris.
Roumanie	M. Phérékyde, Ministre de Roumanie à Paris.
	M. C. F. Robesco, Directeur-Général des Postes et Télégraphes.
	M. Emmanuel Bacaloglou, Professeur de Physique à la Faculté des Sciences de Bucarest.
Russie.....	M. le Vice-Amiral Likhatcheff.
	M. le Conseiller de Collège Rusi.
Salvador.....	M. Torrès Caïcedo, Ministre du Salvador à Paris.
	M. Raynaud, Ingénieur des Télégraphes.
Serbie.....	M. Marinovitch, Ministre de Serbie à Paris.
Suède.....	M. Nyström, Chef de division à la Direction royale des Télégraphes.

Governments.	Names of Delegates.
Suisse	M. Kern, Ministre de la Suisse à Paris.
Turquie	Lacoine-Effendi, Directeur du Bureau technique de l'Administration des Télégraphes. Missak-Effendi, 1er Secrétaire de l'Ambassade.
Uruguay.....	M. le Colonel Diaz, Chargé d'Affaires de l'Uruguay à Paris.
Bureau international de Berne	M. Curchod, Directeur du Bureau.

M. Lavollée, Consul-Général de France.
M. Eschbaecher, Chef de Bureau au Ministère des Postes et des Télégraphes. } *Secrétaires de la Conférence.*

[For list of delegates attending the Conference on Electrical Units, see our "Notes" columns.]

COMPETITION IN TELEGRAPHY.

An article in the *Philadelphia Record* states that Mr. Gould offered 1,500,000 dols. for fifty-one shares out of the one hundred shares of stock of a prominent New York daily, but without success.

The associated press pays the Western Union Telegraph Company 600,000 dols. This fact may give some idea of the magnitude of the business which Mr. Gould is seeking to control. There is another announcement made at the same time, which shows that the business of telegraphing is not to remain in its present monopolastic condition. Heretofore all attempts to found new telegraph companies on a large scale have resulted in disappointment to the public, though usually with profit to the promoters. The opposition was formerly made by Mr. Gould, who then found consolidation with the Western Union and control of the latter to be the plan affording him most gain. Hence the great hopes of the public from the building of the Mutual Union lines speedily became abortive. There is, however, not so much cause for alarm in the circumstances of the present telegraphic situation as many persons suppose. There is also one feature of the case to be stated, which may put a different and not wholly unwarranted face on the effort of Mr. Gould to control the associated press reports. A new rival is going into the business of building telegraphs, and Mr. Gould, whatever other use he may have, evidently desires to control the 600,000 dols. of business, "a growing business too," which the associated press has to give out. Say that Mr. Gould is too sensible to ruin the character of an association which he might control, or say that he could make more by ruining it. Either way, as a financier, his object his money, and there is no moral principle worth a straw in Wall Street involved. But say that the associated press is intended to be continued, and that in its absence something similar would speedily be devised. In that case Mr. Gould must be aware that what he has done others may do, and at this moment a project is on foot, such as is thus described by the above-mentioned journal.

"Mr. John W. Garrett is forming a company to lay an Atlantic cable in opposition to Gould's lines. Mr. Garrett is worth between 10,000,000 and 15,000,000 dols. He is building telegraph lines in every part of the country in competition with the Western Union Telegraph Company, and he proposes that his communications with Europe shall not be regulated by Mr. Gould's whims. Robert Garrett is in Europe, working up the project. A landing on this side has been assured. Siemens, the great electrician of Berlin, is working in hearty accord with the Garretts and has given them to understand that he will take all the stock not otherwise parcelled out. He says that a cable, with all the modern improvements, can be laid for one-fourth of the cost of the lines now connecting the two continents. Mr. James Gordon Bennett, of the New York Herald, put his name down for half-a-million of the stock of the company, and promised to raise the amount to a million if necessary. Mr. Garrett has also subscribed half-a-million. Capitalists of Boston, New York, and Philadelphia also appear in the list, and opposite their names are figures from 100,000 dols. downwards. The stock thus subscribed for is to be placed in the hands of trustees for a period of three years. The telegraph charges at no time are to exceed sixpence, or twelve cents, a word. This bold undertaking will probably provoke a lively war."

The first point in the war would naturally be to secure the control of a large and profitable portion of the telegraph business, and Mr. Gould would not display his wonted sagacity if he did not seek to control the dispensing of the associated press patronage. Successful men in these days do not trust to kind dispositions, but try to make themselves mathematically certain at every point. It will of course be a good thing for the public if Mr. Garrett and his colleagues will duplicate all Mr. Gould's lines, while Messrs. Gould and Pender will extend a manifold telegraph girdle around the world. Competition is the remedy for monopoly, and there can be no monopoly of such a useful and necessary, and now universal business, provided no exclusive franchises are granted.

[We are indebted to the *Galveston Daily News* for the above facts.]

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer, not necessarily for publication, but as a guarantee of good faith.

Letters, &c., for the "Correspondence" columns should arrive not later than Tuesday morning if they are desired to appear in the following number, such communications to be addressed to the "Editors," Electrical Review, 22, Paternoster Row, London, E.C.

Letters respecting Advertisements, Subscriptions, &c., should be sent to the "Publisher," Electrical Review, at above address.

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Cheques and Post-office Orders (on Chief Office, London) to be made payable to H. Alabaster.

CORRESPONDENCE.

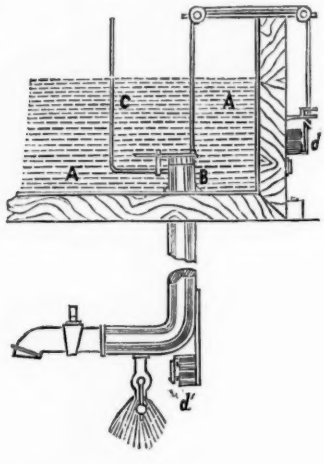
THE PROTECTION OF WATER PIPES.

To the Editors of The Electrical Review.

Gentlemen,—I enclose a tracing of an useful little invention recently patented by my friends Drs. Buxton and Ross, and as the cold weather will shortly be here, it may interest some of your readers to know that so simple a means for preventing the bursting of water pipes from frost may be had for so small a sum. I do not know if the drawing will make all clear, but nevertheless send a short sketch.

A represents an ordinary house cistern, showing the service pipe with the tap at end; into this is screwed or driven the small ventilating valve, B. It will be seen that air is admitted to the underside of the valve by the small pipe, C, so that when the valve is closed the pipe can be emptied, air being admitted through the pipe for such purpose. During the summer months the valve is raised by means of the cord shown, which can be attached to a nail or hook, and when frost is expected the cord is unfastened and the valve falling upon its seat, the pipe can be emptied by simply turning on the tap. So far perhaps this invention may not be of any *special* interest to you. To avoid forgetfulness on the part of servants, I have added the little electrical arrangement

shown, which is governed by a thermometer, and so long as the temperature is above 33° the valve does not act, but should it fall to that point an electric current passes, releasing the catches, d, d^1, which are so arranged as to cut out the battery and open the pipe at the lowest point of the house



service. A model of this for simply closing the valve electrically was exhibited for months at the late electrical exhibition at the Crystal Palace and excited some attention. The valves are sold at from 2s. 6d. each ; any one can fit them. The electrical arrangement varies in its cost according to circumstances. I shall be happy to supply any information that may be required, and the valves can be obtained from me.

Yours truly,
FRANCIS M. ROGERS.

21, Finsbury Pavement.
October 12th, 1882.

THE GRISCOM ELECTRO-MOTOR.

To the Editors of The Electrical Review.

Dear Sirs,—In the Electrical Review of September 23rd an able writer, who discusses my double induction motor, quotes and combats a theory which he attributes to me. This theory is one of the many advanced in explanation of the motor by various European periodicals, but of which I plead entire innocence ; in fact, I have purposely abstained from offering an explanation of the phenomenon which, for want of a better name, I have called "double induction." This phenomenon is described by the famous Mr. Hospitalier as follows :—

"The current of the electric source then only traverses the armature. Under these conditions if the current of the field magnet is open, the motor goes slowly enough, and even stops sometimes. By closing the circuit of the electro-magnet on itself, the speed of the motor is greatly increased, *the currents of induction developed in the wire which forms a closed circuit will then polarise the fixed magnet continuously, and maintain its magnetism with polarities, suitable to the direction of its rotation.*" *

Of course no one can suppose that a motor can produce more electricity than is supplied to it, and the writer does me an unconscious injustice in attributing such a fanciful theory to me. I even go further, and believe that induction, far from being an obstacle in motors, is the measure of their efficiency. If other views with regard to this latter proposition are held in England, I should be very glad to see them expounded.

Yours truly,
W. W. GRISCOM.

Philadelphia, *October 6th*, 1882.

The following is the original of Mr. Griscom's quotation from Mr. Hospitalier's description of the double induction motor in *L'Electricien*, October 1st, 1881 :—

"Le courant de la source électrique ne traverse alors que la bobine. Dans ces conditions, si le circuit de l'armature fixe est ouvert, le moteur marche assez lentement et s'arrête même quelquefois. En fermant le circuit de l'armature fixe sur lui-même, la vitesse du moteur est grandement accrue, les courants d'induction développés dans le fil qui forme un circuit fermé polarisent alors l'armature fixe d'une façon continue et maintiennent son magnétisme avec les polarités qui conviennent au sens de la rotation."

[We are sorry that we inadvertently credited Mr. Griscom with the ideas put forward in the advertisements of the Electro-dynamic Company of Philadelphia, and we have pleasure in publishing his explanations. Perhaps our correspondent may now have seen our second article on this subject.—Eds. Elec. Rev.]

* The italics are mine.

THE ELECTRIC LIGHT AT CHESTERFIELD.

To the Editors of The Electrical Review.

Gentlemen,—As the Brush system of lighting has hitherto been regarded as one of the most efficient of the many systems before the public, the letter which Alderman Gee has addressed to the *Standard*, and which you republished last week, in reference to the electric lighting of Chesterfield, must have been read with some amount of surprise. It has certainly astonished not a few people in Chesterfield.

This town, which claims the honour of being the first to have the whole of its streets lit with electricity, was formerly illuminated with 200 gas lamps ; and the lighting, which Alderman Gee characterises as a decided failure, is now done by means of 22 Brush arc lamps, of nominally 2,000 candle-power each, and 100 incandescence lamps of the Lane-Fox pattern, each supposed to give a 15 candle-power light. The town, it should be stated, is very irregularly built, and the Lane-Fox are used in the narrower streets and "passages," of which latter there are a number in the town. The arc lamps, Alderman Gee says, "are doing good service in some of the large streets," and it may naturally be presumed that he does not intend the word "failure" to apply to these. The incandescence lamps do vary in the amount of light, but the Mayor at a meeting of the Council last week, referring to them, said—

"Some possessed an illuminating power which really surprised him, the amount of light they gave being equal to 15 or 16 candle-power ; whilst other lamps were as low as five or six candle-power. That was the cause of very great disappointment. . . . It was quite evident that the lighting of the town by the electric light had not succeeded to their expectation or to the expectation of the contractors, and yet they could hardly wonder. They must remember that Chesterfield was the first town lighted by electricity, and that a great deal of the work was necessarily tentative. The contractors had had to feel their way again and again. Incandescent lamps had never been employed for street lighting previous to their being used at Chesterfield. His impression was, considering the infancy of the electric lighting, that the company had done wonders."

Alderman Gee, at the same meeting, stated that the reason of this difference was that the contractor had not been able to get the proper lamps down from the Lane-Fox department. Some new Lane-Fox lamps, more nearly resembling the Swan in shape, are however now being put up in the town, and are giving the greatest satisfaction. As to the tradesmen of Chesterfield not adopting the arc light, it should be observed that there are not half-a-dozen shops in the town where more than thirty gas burners are used, and it is, therefore, absurd to suppose that arc lights of 2,000, or even 1,000 candle-power, could be profitably introduced into such comparatively small establishments. I enclose my card,

And remain,
ONE WHO DOES NOT BELIEVE THE ELECTRIC LIGHT HAS BEEN A FAILURE.

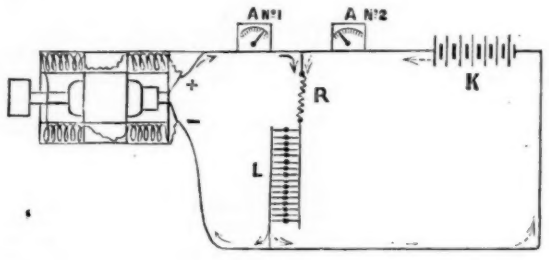
STORAGE OR SECONDARY BATTERIES.

To the Editors of The Electrical Review.

Dear Sirs,—Having lately gone on M. de Kabath's behalf to conduct an installation of his accumulators at M. Jaspar's, at Liege, I was led to make an experiment in order to demonstrate the efficacy of accumulators as a regulator for an unsteady supply of primary current.

Below is a sketch of the various connections and general arrangement; the direction of the am-meter pointers, A, indicating the direction of the current passing through them; the arrows indicate direction of machine current, and the dotted arrows the direction of secondary current, or that of the accumulators.

The field magnets of machine (Gramme type d'Atelier) were wound with fine wire, having a high resistance, and were connected up in a shunt, as shown. Two am-meters were placed in circuit (as shown), and the derivation for



lamp circuit was taken midway between these two, a suitable resistance being interposed in this derived circuit, as shown at R. I commenced by charging direct the 35 Kabath accumulators, K, for about one quarter hour; this was done so as to have a reserve force to draw from. The lamp circuit of derivation of 16 Maxim lamps, L, was then connected, and sufficient current went by this derivation to maintain the lights at their normal capacity. The speed of machine was about 1,100 revolutions per minute, and at that time both am-meter pointers, having a right-hand deflection, indicated that the current of machine was sufficiently powerful to maintain the lamp circuit, and at same time to charge the accumulators.

On slowing down the speed of machine, the pointer of am-meter No. 2 assumed a left-handed deflection, as shown in sketch, and it was, therefore, evident that the accumulators were now discharging through lamp circuit, and thus helping the machine current. It will thus be seen that at the point of "take off" for the lamp circuit, there were two opposing forces which were diverted into one common force through the lamp circuit, and afterwards divided to satisfy their respective equilibrium. We now commenced changing the speed of machine by rapid and jerky motions, such variations exceeding 50 per cent. of the normal speed; not even a flicker, however, was noticeable in the lamps, which all along gave a perfectly steady light. The machine was then slowed down, so that the pointer of No. 1 am-meter was at zero, thus showing that the opposing electromotive force was such as to prevent the machine from generating any current. If the machine had been slowed down below this point, I anticipate that the accumulators would have discharged through the armature of machine and possibly burnt it, so consequently I looked upon this as the minimum speed. The charging circuit was now broken, and the lamps continued to burn without any alteration, being now fed by the accumulators alone.

There may be nothing new in this arrangement of accumulators, but I was certainly surprised to see the effective manner in which they kept the current perfectly constant, under such trying and great variations of speed.

It will also be seen that in a disposition like this, one must take into consideration the force of an opposing electromotive force, the same as if it were resistance, but it is difficult to make a simile between the two. For instance, at the point of lamp circuit derivation, the charging current meets an opposing electromotive force, which stops it dead and turns it off into another path; now, if instead of such opposing electromotive force, we had a resistance, no matter how high, there would still be a part of the charging current that would go through that resistance.

It therefore seems to me that interesting experiments could be made to determine exactly the nature and value of opposing electromotive forces, and rules should be laid down which would permit of their being taken into consideration in the same way as resistance. The charging of accumulators and the augmentation of their electromotive force during the charging, will no doubt afford a ready scope for such experiments.

I remain, Gentlemen,

Yours respectfully,

CHARLES W. FARQUHAR.

25, Avenue de l'Opéra, Paris.
October 17th, 1882.

Ways of Doing Business: England *v.* America.—The letter addressed to us by the representative of the Holborn Lamp Works, under the above heading, does not appear to us quite suitable to our correspondence columns, and as the matter of complaint may be almost said to suggest its own remedy, we do not think it necessary to refer further to the subject.

LANCASHIRE AND CHESHIRE TELEPHONIC EXCHANGE COMPANY (LIMITED).

By a circular received from the courteous secretary of the above company, we are informed that, "having made arrangements with the Postmaster-General, through communication, by means of Trunk Lines, has now been established between this company's exchange in Manchester and their exchanges in the following towns:—Liverpool, Blackburn, Burnley, Preston, and Wigan, and the rates fixed for these connections are as under:—

Manchester and	Liverpool	£60	per annum
,,	Blackburn	45	,,
,,	Burnley	40	,,
,,	Preston	55	,,
,,	Wigan	35	,,

"The above rates are exclusive of the company's local exchange subscriptions, which are as follows:—

Manchester	£20	per annum
Liverpool	20	,,
Blackburn	12	,,
Burnley	12	,,
Preston	12	,,
Wigan	12	,,

"Subscribers to the Trunk Lines must also be subscribers to the local exchanges in the towns in which their offices are situated, *i.e.*—supposing A in Manchester wishes to speak to the company's subscribers in Liverpool, he will have to pay the local rate of £20 in Manchester and the Trunk rate of £60, making a total rate of £80 per annum. For this sum he will be able to call up any of the Liverpool subscribers, and they will be able to reply, but the latter cannot originate the conversation unless they also pay the Trunk rate. Special terms, however, can be made with firms having houses in both towns, or having a house in one town and a sole agent in another."

The above proposed extension of the telephone exchange systems alluded to in the preceding circular is in one respect at least gratifying to note; but we cannot disguise from ourselves the fact that the prices asked are very considerable. It will be interesting to observe, by the next report of the company, issued what proportion of the local Exchange subscribers will have availed themselves of the privileges thus offered. It should be an easy matter, we think, to estimate the cost of the said trunk lines, and the rates which would render their probable use remunerative, and it seems equally easy to perceive that a half-hearted policy in meeting the wants of the public will only fail to achieve that great success which a really liberal management would secure, whilst at the same time securing to the company a firm and highly valuable position.

The distance between Liverpool and Manchester is about thirty miles, and there are, we believe, two circuits for the telephone exchange service between them, *i.e.*, four wires comprise the said trunk lines from the one town to the other. Now the postal authorities charge, we think, rentals for such circuits: in the case of over-house wires at the rate of £10

per mile per annum for each two wires, and for open country lines £8 per mile also for each two wires.

It will therefore be comparatively easy to note that the cost of connecting the two exchanges mentioned would be, so far as lines are concerned (and we take the highest figure for our calculation, namely, £10 per mile), about £600 per annum. To this expense would have to be added the cost of two clerks to operate the switches, at the highest calculation, say, £130 per year each; that would give a total of £860.

In fixing a tariff to be remunerative to the company two things must be borne in remembrance—first, the working capacity of the circuits, and second, that the more subscribers obtained, the more valuable the system becomes to all in communication with the said system.

Considering these two things, we feel that the company is not consulting its own interests in demanding such rates as those contained in their circular; indeed, we believe that telephone business generally, in this country, has been injured enormously by excessive charges; but it is not usually so easy to go into even approximate calculations as it is in the instance selected from the Lancashire Company's circular, owing to the difficulty of ascertaining the cost of the various installations, and the value of the assets of such concerns.

In the case we are considering a good opportunity presents itself for viewing by the light of the trunk lines extension rates the general policy of existing telephone companies.

The opportunity is good mainly because the wires are such as are erected by the Post-office authorities at a rental only, and therefore we can get within a trifle at the yearly cost of the wires to the company renting them.

It will be seen by the circular that two firms, one in Manchester and one in Liverpool, would have to pay together for the privilege of conversing by telephone with one another the sum of £120 per year *in addition* to their respective subscriptions to the local exchanges.

The cost to the company, as we have before mentioned, is about £860, as follows:—

Two circuits (four wires) of 30 miles each, at £10 per mile per year...	£600
Two additional clerks to work switches, say	260
	£860

Now it appears that the two towns mentioned have a total of subscribers to the two exchanges numbering 1,334. The question then arises, is it not probable that a more remunerative business could be done by encouraging, by means of a lower tariff, a greater proportion of that number to avail themselves of the means of intercommunication than is likely to do so while the tariff is £60 *additional* per subscriber.

If fourteen subscribers pay each £60 the expense is covered, but what would happen if one hundred paid £15 each? We fancy the value would be increased considerably to each subscriber, because he could converse with so many more than is likely with the higher rate, and this fact again would probably induce other firms to join the local exchanges who before had held aloof, whilst at the same time a handsome addition would be obtained to the net revenue of the company.

One hundred subscriptions of £15 each (in addition to local exchange charges)	£1,500
Deduct 10 per cent. on gross receipts for G.P.O. licence...	150
	£1,350
Expenses of circuits and operators as before stated ...	860
Leaving a balance of	£490

or about 22½ per cent. profit on the amount actually expended for the working of the said trunk lines. There is to be deducted, however, from this percentage, a small proportion for office expenses, &c.

The policy of catering for the few at high rates, rather than for the many at low ones, cannot be more unfortunately applied than in the case of telephonic exchanges, and yet the former is the policy which has, strangely enough, always obtained in this country. Will not the rates quoted in the circular printed at the head of this article prove once again in practice the triteness of the old saying about the nimble penny or the slow shilling?

NOTES.

Perpetual Motion. — After describing the electric launch recently run on the Thames, the *Spectator* of Sept. 30th says:—"Nothing is said about expense, but a boat which can travel at this speed without coal, and with no funnel, must for many purposes be of almost immediate use. *As the charging machines can be put up anywhere, the practical problem of electricians must be to reduce the size and weight of the accumulators. Once small enough to be carried, they might drive a steamer across the Atlantic, being perpetually recharged by a dynamo driven by the motion itself.*"

The Steam-ship "Silvertown."—The India-rubber, Gutta-percha, and Telegraph Works Company have received a telegram from San Francisco informing them of the safe arrival of their steamer *Silvertown* at that port on Sunday, the 15th inst. All well on board.

Lightning Conductors.—Messrs. Dixon, Corbitt, & Spence, manufacturers of Vyle's patent easily-tested lightning conductors, received the highest award (silver medal) for such exhibits at the Tynemouth Exhibition.

The Electric Light on board Ship.—The s.s. *Tararvera* and *Waihora*, now building by Messrs. Denny Bros., of Dumbarton, for the Union Steam Ship Company of New Zealand (Limited) are to be lighted by the Edison Electric Light Company. Each steamer will be lit by about 150 A lamps of 16 actual candle-power, supplied by an Edison L Dynamo, driven direct by a Brotherhood engine.

The yacht *Namouna*, which belongs to Mr. James Gordon Bennett, of the *New York Herald*, is lighted throughout with the Edison system, comprising about 150 A lamps fed by an L dynamo, driven from a special engine by belting. Although exposed to some severe storms in her passage across the Atlantic to the coast of France, the light fully proved its reliability under stress of weather, nor was there any tendency of the belt to slip even when the sea was at its roughest.

This fact is important as proving that although engines driving direct may be preferred by some ship-builders, their fears in regard to slipping of the belt and consequent extinction of the light in a heavy sea, are more theoretical than practical.

Electric Lighting and the "Ferranti" Machine.—The following letter, which appeared in the *Times* of Tuesday last, is of sufficient importance to reproduce in our columns:—

Mr. Charles Mossop, in addressing you under the above heading, has more than once made reference to the evidence I gave some months ago before a Parliamentary Committee regarding the cost of establishing the electric light in populous districts. He says:—"No doubt great strides have been made in three months, but it is difficult to understand that the figures then given—£100,000 per centre and a cost of £22,000 annually—have so nearly disappeared." Mr. Mossop has correctly quoted the figures I gave before the committee, only in a previous letter of the 28th ult. he made me attribute them to a district of one square mile area, whereas I distinctly stated that they were the estimated amounts appertaining to one-quarter of a square mile only of a densely-populated and well-to-do neighbourhood. They were based upon the results of actual and somewhat extensive experience, and on the assumption that the electric light was to take only a minor share in the total illumination, leaving still to gas all ordinary domestic uses. Nor do I know of any very recent discovery of a character likely to affect these figures.

It is true we have been told lately of a new dynamo machine to which iron in the rotating coil is dispensed with, and which is said to be capable of developing a light of 2,000 candles with an expenditure of three-fourths of an indicated horse-power. In testing these results by the dictates of science I find they exceed considerably the utmost limits that could possibly be attained with a dynamo-machine and lamp of ideal perfection, and must therefore be regarded as chimerical. But, although the new patent has not yet been specified, enough has transpired regarding its character to enable me to judge of its real capabilities. The inventor has been until recently employed at my works, and the machine with which he proposes to revolutionise the world is only a modification in minor details of the Siemens alternate-current machine, which is largely used, and which completely embodies the much-vaunted quality of the absence of iron in the rotating coils.

Electric lighting appears to have entered a stage at which the public just possesses sufficient knowledge of the subject to make them follow any sanguine leader into the realms of speculation; and, so far from

regretting the want of readiness shown on the part of local authorities to favour the granting of licences and the procuring of provisional orders, I think that real progress would be very much retarded by the granting of such applications without reserve. The mechanical means at present at the disposal of many of the electric lighting companies are as yet entirely inadequate to grapple with the enormous production of valuable plant necessary for such applications on a comprehensive scale, and it would therefore be advisable that each grant should be made conditional on the work being effected within a limited time.

I am your obedient servant,

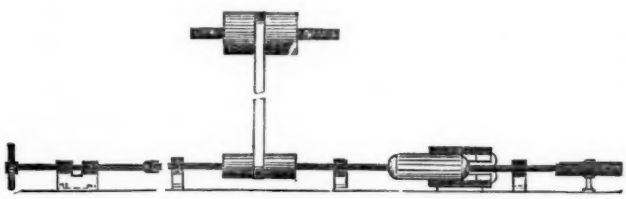
12, Queen Anne's Gate, S.W. C. W. Siemens.

The second portion of Dr. Siemens' letter appears to call for a few remarks. We agree with this eminent electrician in his criticism regarding the production of a light of 2,000 candles at an expenditure of three-fourths of an indicated horse-power, but beyond this we cannot go. We have not yet seen the "Ferranti" machine, neither has Dr. Siemens, we believe, but if the brief description of its construction which we received some weeks ago from one of the representatives of the Hammond Company was correct, we can safely say that the invention is something more than a "modification in minor details" of Dr. Siemens' aternating current machine.

Without taking the decided views on this subject which some of our contemporaries have thought fit to adopt, it may be well to recall the fact that sometimes the opinions of equally celebrated electricians—as well as lawyers—may differ. As an instance of this let us go back to the introduction of the Gramme machine model (by Werdermann) into England.

A few electricians encouraged him, while some high authorities unhesitatingly pronounced the invention a "mistake," and the ideas of the inventor "quite impossible of realisation." One indeed, scarcely inferior in ability, if at all, to Dr. Siemens himself, to whom Mr. Werdermann submitted the machine, declared it to be "mere nonsense." We are all aware of the great success achieved by the Gramme machine, and we all know that doctors disagree. Whilst advising our readers not to put too much faith in any extravagant assertions which may have been spread abroad concerning the efficiency of the new dynamo, we think that in the face of the instance given above, it is well to bear on the side of caution, and we shall reserve any definite opinion on the "Ferranti" machine until we have had the opportunity of seeing and examining it. Dr. Siemens ranks high as an authority on electrical matters, but we may assume that Sir William Thomson, who is also equally well known as an expert on such matters, is satisfied with the *bona fides* of the invention with which his name has been associated.

Dynamo-Electric Machine.—Patent No. 262,782. Filed in the United States of America Patent Office, February 25th, 1882, by John H. Irwin.



Claim.—1. In a dynamo-electric machine, the combination of an armature adapted and arranged to be drawn out of or pressed into the field-of-force magnets and a commutator adapted and arranged to have movement across the face of its brushes, substantially as described.

2. In a dynamo-electric generator, the combination with the armature, of a screw connected therewith and adapted and arranged to control the position of the armature within the field of the exciting magnets, substantially as shown and described.

3. The combination, with the field-of-force magnets, of an armature, shaft, screw, bearing wheel, and commutator, the whole arranged to operate substantially as shown and described.

4. In a dynamo-electric machine, the combination of enclosing field-of-force magnets, an enclosed armature, and a commutator, the armature and commutator being adjustable back and forth by the same mechanical means, substantially as described.

5. In a dynamo-electric machine, the combination of the field-of-force magnets, an armature and a commutator, both adjustable back and forth, and the latter elongated, so as to be at all times subject to sufficient contact with the commutator-brushes, substantially as described.

6. In combination, in a dynamo-electric machine having enclosing field-of-force magnets and an enclosed armature, a shaft to which both the armature and the commutator are directly secured, provided with a clutch adapted to permit free revolution of the shaft while the same may be moved back and forth, substantially as described.

Electric Lighting.—The electric light was introduced to the Motherwell district on Friday week by Messrs. James Goodwin and Co., ironfounders. A lamp was placed on a pinnacle of the works in Park Street, and not only lighted the whole departments of the works, but shed a clear light in Park Street and Merray Street, and the surrounding neighbourhood. During the night large crowds of people assembled in the vicinity of the light. The Police Commissioners are negotiating for the introduction of the light for the town lighting.

At a special meeting held last week the Hamilton Town Council appointed a committee to report on the expediency of applying for a Provisional Order under the Electric Lighting Act.

Melbourne hitherto has been rather behind in adopting the electric system of lighting cities, the only result being in the erection of four lamps in the Eastern Market. Probably an effort of the Government to light the railway station at the Spencer Street Terminus may bring it into greater favour, as an offer has been made to erect lights by a public company gratuitously, as an experiment, and the Government has given its consent. Besides these signs of progress, a company has asked permission of the Government to drive a tunnel from a point on the Yarra at Dight's Falls, through a portion of Studley Park to a place a quarter of a mile lower down the river. This would give a fall from point to point of 27 ft., and, it is said, would supply sufficient force to generate electricity enough to supply the whole of Melbourne and the suburbs. The Government, in the meantime, will take the request into consideration. Melbourne is not particularly happy with its present supply of gas, and, unfortunately, must submit, as the competing gas companies were permitted to coalesce, and now have a monopoly in the lighting of the city.

The Forfar Town Council have agreed to delay in moving for a Provisional Order. The convener pointed out that the corporation could only oppose an application by any electric lighting company to Parliament for powers to light the town by electricity on the ground that it would be fatal to the interests of the town. The introduction of the electric light would be so in Forfar, for there was £1,000 of an annual burden in connection with the gas works of the town for all time coming.

A special meeting of the Glasgow Town Council was called for Thursday, to consider the propriety of applying to the Board of Trade this year for a Provisional Order under the Electric Lighting Act, 1872.

The Bradford Town Council, at a meeting on Tuesday, authorised the Town Clerk to take the necessary steps under the Electric Lighting Act to obtain powers for supplying electricity for public and private lighting purposes within the burgh.

A New Electric Light.—We have been much interested in examining a new candidate for public favour in the way of an incandescent electric light; we refer to the one manufactured by the Bernstein Electric Light Manufacturing Company, of 41, Arch Street, Boston. This light has some especial features, was patented in June, 1882 (English) application of 2nd June), and is based on entirely different principles from all the patented systems of incandescent lamps. It is unlike the Edison, Swan, and Maxim; where each of these use a very delicate carbon filament as a light giving body (and these filaments do not withstand the action of strong currents of electricity, but are easily destroyed, and economy in an incandescent system of lighting is obtained by an application of a strong current), in the Bernstein lamp, the light is given out by an unfusible and insulating material, which has been covered with a deposit of carbon, having the shape of a cylinder. This lamp, the Bernstein, gives a very brilliant light, which can be regulated or graduated just as appears desirable or necessary. Lamps of different powers are furnished as desired, and any kind of dynamo machine may be used to furnish the current.—*Boston Journal of Commerce*, September 30th.

Electric Illumination of the Instrument Hall of the Head Telegraph Office at Berlin.—This hall was formerly lighted up with 103 gas burners. With such a number of flames it is natural that, in spite of the numerous and efficient ventilators, the temperature became unpleasantly high, and that the air was seriously contaminated with the products of combustion. Hence it was resolved, in the course of last spring, to make experiments with Swan's incandescence lamps. A gas-engine kept a Siemens' alternating current machine (model W^3) in motion, and this furnished the current needed for 18 Swan lamps, which were substituted for the same number of gas flames.

These lamps were in action from the approach of darkness to 9 p.m., giving out a mild, equable light, agreeable to the eye. As the heating power of these lamps is quite insignificant in comparison with that of the gas burners, and as the duration of the light fully answered expectation, the Post-office resolved to make arrangements for lighting the hall exclusively by means of electricity.

Two Heine's steam-boilers were erected on an adjacent plot of ground, furnishing steam for two dock engines, which work up to 15 horse-power. The necessary current will be produced by Siemens' dynamo machines.

An ultimate decision on the number of the lamps, &c., has not been arrived at, as the postal authorities purpose making experiments on the applicability of the arc light (Siemens' differential lamps). During the experiments with the Swan lamps an occasional extinction of some of the lamps had occurred, due generally to contact between the wires which were only temporarily secured. Although with permanent arrangements such contacts would not be apprehended, doubts arose concerning the great number of the incandescence lamps required, each of which would be a possible source of mishap, and it was feared that considerable trouble would be required for keeping the lamps in order and removing any disturbance.

A single arc light illumines a considerable space, and 10 to 12 such lights would suffice for the entire hall. The overlooking and management of so small a number of lights would be easier than that of 103 incandescence lamps. Hence for the present the twenty work tables on the side of the Jägerstrasse are to be lighted with the same number of incandescence lamps, whilst the rest of the space will be illuminated with differential lamps.—*Electrotech. Zeitschrift.*

Local Authorities and the Electric Light.—The Board of Works for the Wandsworth District agreed on Wednesday afternoon to the following recommendation of its General Purposes Committee :—"The Committee have considered the applications for the consent of the Board to Board of Trade licences or provisional orders being granted for the supply of electricity within the district, received from the following companies: The Metropolitan (Brush), the Gülcher, the Edison, and the West Middlesex, and Messrs. Ferranti, Thompson, and Ince ; and recommend that the Board do not grant their consent to any of the proposed schemes, and that the applicants and the Board of Trade be informed accordingly ; and that the Board of Trade be further informed that the Board have it in contemplation to apply for a licence themselves for the supply of electricity in the district when the system of electric light is more matured."

The Transmission of Articulate Speech and Singing by means of Telephones without Wires attached to them.—Mr. Frederick John Smith, of Taunton, has communicated to us the following note relating to his experiments on the above subject :—If a large coil of wire be made, from three to 10 ft. in diameter (these were the sizes tried), and placed in connection with a microphonic transmitter ; then if the transmitter be either spoken to, or sung to, the voice is perfectly reproduced in a telephone consisting of only a magnet and disc, held within the great coil. The telephone will give its sound when held at any angle within the coil, but its greatest sound is when the disc is in the same plane as the coil. The effect is augmented if two coils, hung about a foot apart, and two telephones, without bobbins, be used, the head being placed between them. Perhaps the best result is obtained by using two coils of the form used in Gaugain's galvanometer, placed with their vertices pointing to each ear ; two light discs and magnets are then attached to the ears by a spring ; thus the operator is quite unincumbered by any wires whatever. The Gaugain coils are put in circuit, with a microphonic transmitter and battery, in the same way as the large coil.

Experiments similar to those described by Mr. Smith were made some time ago by Mr. Willoughby Smith and referred to by him at one of the meetings of the Society of Telegraph Engineers and of Electricians during the present year. Perhaps our correspondent has not seen Mr. W. Smith's pamphlet on "Induction," in which these experiments are described.

Technical Education.—A class in electrical engineering, in connection with the City and Guilds of London, has again been formed at the Royal Institution, Hull, conducted by Mr. Thos. West, of the telegraph department, and is well attended by members of the telegraph staff in that town. The extension of these classes must ultimately benefit the department by improving the technical knowledge of the employés. In this respect they are far behind many continental countries, where a high scientific training is considered a necessity.

Legal.—The United Telephone Company v. Harrison, Cox-Walker, and Company.—This case came again before the court on Wednesday, the 18th, and was a motion to commit the defendants for not having complied with the order of Mr. Justice Fry, of the 19th of May last, for non-delivery of certain instruments which had, since that judgment, come into their possession. It having been proved (by affidavit) that the said instruments had not come into the defendants' possession, the motion was dismissed, the costs consequently having to be paid by the plaintiff company.

The North-East Coast Exhibition.—Messrs, Mechan and Sons, Cranston Hill, have been awarded a silver medal for their patent reply engine and steering telegraph, and a silver medal for their ships' lighthouses.

On the New Employment, in Therapeutic-Electricity, of Clay.—Académie de Médecine de Paris, meeting of the 10th October, 1882.—Doctor Apostoli presented to the Académie a memoir, of which these are the conclusions :—I advocate the introduction, into the practice of electro-therapeutics, of the use of a new electrode, clay, destined to replace, in many cases, the rigid electrodes almost solely employed up to this day. Clinically, it offers the following advantages :

1. It facilitates and completes certain galvano-caustic chemical applications, that is to say, positive or negative cauterisation applied to the treatment of ulcers and wounds of a bad nature. Better than any other electrode, it limits and terminates certainly all electrolytic action, cauterising all that wants cauterising, without exceeding the limits traced beforehand.

2. It makes sure of a greater constancy of current. A little more resistance, in fact, than ordinary plugs, it dries up less rapidly, and preserves longer the same degree of conductibility ; it moistens well the epidermis, and applies itself uniformly upon it.

3. It facilitates applications of long duration. It is sufficiently viscous, in fact, to adhere spontaneously to the skin, it avoids, thus, the necessity of an assistant.

4. It allows of varying at will, the extent, the form of the electrodes, and their application surface, and is calculated to familiarise the practice of galvanisation, for it is an electrode, soft, easy to obtain everywhere, which is not consumed, takes any desired form, moulds itself upon the skin, and covers a facultative extent of surface.

5. It allows of limiting, of localising the total action of the current by reducing to the minimum the bad influence of its diffusion, or of its derivation. One can, in fact, close the circuit upon itself by means of two concentric poles, and increase, thus, without danger the intensity of the current, and render the operation more complete and more rapid. Galvano-caustic chemical applications to the head, and the cure of aneurisms of the aorta, ought to derive great benefit from it.

6. It diminishes the pain of galvano-caustic chemical applications. By rendering the skin more conductive, owing to a more complete humectation, it diminishes the resistance to its passage, and, consequently, the calorific effects of the current of which pain is the direct consequence.

INTERNATIONAL CONFERENCE FOR THE DETERMINATION OF ELECTRICAL UNITS.—List of Powers represented at the Conference.

Governments.	Names of Delegates.
Allemagne.....	M. le Dr. Werner Siemens, Conseiller intime de Gouvernement, Berlin.
	M. le Dr. Wiedemann, Conseiller de cour, Professeur à l'Université de Leipzig.
	M. le Dr. Helmholtz, Conseiller intime, Berlin.
	M. le Dr. Kohbrausch, Professeur, Wurtzbourg.
	M. Ludewig, Conseiller intime des Postes, Berlin.
Autriche.....	M. H. Militzer, Conseiller au Ministère du Commerce.
Hongrie	M. Isidore Tröhlich, Professeur à l'Université de Buda, Pesth.
République Argentine	M. le Colonel Mansilla.
Belgique	M. Banneux, Ingénieur en Chef des Télégraphes de l'Etat, M. Rousseau, Professeur à l'Université de Bruxelles et à l'Ecole Militaire, 1ère Commission.
	M. Evrard, Ingénieur des Télégraphes, de l'Etat; M. Gérard, sous Ingénieur des Télégraphes, Chargé de cours à l'Université de Liège; M. Pérard, Professeur à l'Université de Liège; Mr. Van Rysselberghe, Météorologiste à l'Observatoire de Bruxelles, 2e Commission.
	M. Van den Mensbrugghe, Professeur à l'Université de Gand, 3e Commission.
Chine	M. Macartney, M. Tching-Tchang, Secrétaries de la Légation de Chine à Paris.
Colombie	M. le Dr. Triana, Consul-General de Colombie à Paris.
Costa-Rica.....	M. Léon Somzée, Premier Secrétaire de la Légation.
Danemark	M. Lorenz, Professeur à l'Ecole Militaire de Copenhague, 1ère Commission.
	M. le Capitaine Hoffmayer, Directeur de l'Institut Météorologique, 2e Commission.
Espagne	M. Adolfo J. Montenegro, Inspecteur des Télégraphes.
	M. Justo Uruna y Velasco, Directeur de Section de 1ère Classe des Télégraphes.
Etats-Unis	M. Trowbridge, Professeur à l'Université d'Harvard.
	M. H. A. Rowland, Professeur à l'Université de John Hopkins.
	M. G. F. Barker, Professeur à l'Université de Pensylvanie.
France	Son Excellence M. Cochéry, Ministre des Postes et des Télégraphes.
	M. J. B. Dumas, Secrétaire perpétuel de l'Académie des Sciences, Membre de l'Académie Française.
	M. Jamin, Membre de l'Académie des Sciences, Professeur à la Faculté des Sciences de Paris.
	M. Clavery, Ministre Plénipotentiaire, Directeur des Affaires Commerciales et Consulaires au Ministère des Affaires Etrangères.
	M. Bergon, Directeur du Matériel et de la Construction au Ministère des Postes et des Télégraphes.
	M. Blavier, Directeur-ingénieur des Télégraphes, Directeur de l'Ecole supérieure de Télégraphie.
	M. Mascart, Professeur au Collège de France, Directeur du Bureau central météorologique.
Grande-Bretagne	Sir William Thomson, F.R.S., Professeur à l'Université de Glascow.
	M. Carey Foster, F.R.S., Professeur, Université Collège, Londres.
	Lord Rayleigh, F.R.S., Professeur à l'Université de Cambridge, Pair du Royaume.
	M. Fleeming Jenkin, F.R.S., Professeur à l'Université d'Edimbourg.
	M. le Dr. Hopkinson, F.R.S.
Grèce	M. le Ministre de Grèce à Paris.
	M. Protopappadaky.
	M. Timoléon Argyropoulo, Professeur de Physique à l'Ecole Militaire d'Athènes.
Guatémala.....	M. Crisanto Medina, Ministre du Guatémala à Paris.
Italie	M. le Chevalier Joseph Pisati, Professeur de Physique à l'Ecole d'Application de Rome pour les Ingénieurs et à l'Institut supérieur de Florence; M. le Chevalier Antoine Roiti, Professeur de Physique à l'Ecole d'Application de Rome pour les Ingénieurs et à l'Institut supérieur de Florence, 1ère et 3e Commissions.
	M. le Commandeur Jean Cantoni, Sénateur du Royaume, Professeur à l'Université de Pavie; M. le Commandeur Pierre Tacchini, Directeur du Bureau central de météorologie, 2e Commission.
	M. le Chevalier Galileo Ferraris, Professeur au Musée Industriel de Turin, pour les 3e Commissions.
Japon	M. Henri Becquerel, répétiteur à l'Ecole Polytechnique.
Luxembourg.....	M. Willière, Ingénieur, Directeur des Chemins de fer du Prince Henri.
Mexique.....	M. F. Diaz Covarrubias, Ingénieur-géographe.
Nicaragua	M. Baille, répétiteur à l'Ecole Polytechnique.
Norvège	M. Broch, Ancien Ministre, Professeur à l'Université de Christiania.
Pays-Bas	M. le Dr. G. Bosscha, Directeur de l'Ecole Polytechnique à Delft.
Portugal.....	M. d'Azevedo, Chargé d'Affaires à Paris.
	M. Edouard Robert Silva, répétiteur à l'Ecole centrale des Arts et Manufactures de Paris.
République Dominicaine	M. le Baron d'Almeda, Ministre de la République Dominicaine à Paris.
Roumanie	M. Phérékyde, Ministre de Roumanie à Paris.
	M. C. F. Robesco, Directeur-Général des Postes et Télégraphes de Roumanie.
	M. Emmanuel Bacaloglon, Professeur de Physique à la Faculté des Sciences de Bucarest.
Russie..... ..	M. le Conseiller Lentz, Professeur à l'Institut Technologique de St-Pétersbourg.
	M. l'Académicien Wild.
Salvador.....	M. le Ministre de Salvador à Paris.
	M. Jules Raynaud, Ingénieur des Télégraphes.
Suède	M. Nyström, Chef de Division à la Direction Royale des Télégraphes.
Suisse	M. Weber, Professeur au Polytechnicum de Zurich.

TENDERS FOR TELEGRAPH CONSTRUCTION.—Tenders are invited by the Government of the Orange Free State for the supply of material and the erection of the following telegraph lines in the Orange Free State, South Africa:—Between Winburg and the Vaalriver, *via* Ventersburg, Kroonstad and Heilbron; between Winburg and Ladybrand; between Senekal and Ficksburg, and between Wepener and Smithfield. No tender will be entertained unless for the whole of these lines. The probable aggregate mileage of the lines combined will be about 350 miles, more or less. The average number of poles required per mile will be about 18. The percentage of No. 8 (straining posts) will be about 6 per cent. Specifications are to be seen, and other information obtained, at the offices of the different Free State consuls, in England at London, in Germany at Berlin and Hamburg, in Holland at Arnhem, in Belgium at Brussels, in France at Paris, in America at Philadelphia, and at the office of the Government Secretary at Bloemfontein, Orange Free State.

EXPERIMENTS IN TELEPHONY.—M. Van Rysselberghe has communicated the following interesting note to *L'Opinion*:—The Minister of Public Works having, a short time since, ordered some experiments of telephony on long distances to be made, a complete application of the system of M. Van Rysselberghe was made upon the lines of the Belgian telegraphic network. The trials took place on Saturday, the 7th October, and were crowned with complete success. At Brussels, at the Observatory, were stationed: M. Olin, Minister of Public Works; Mr. Fish, Resident Minister of the United States charged by his Government to inform them on the new method; M. De Large, Director of Telegraphs; M. Weissembruck, Secretary to the Minister of Public Works; M. Hooreman, doing duty for the director of the Observatory, and M. Van Rysselberghe. At North Brussels: M. Buels, head of the telegraph administration office. At Anvers: Inspector Banneux. At Ostend: Engineer Lambotte and M. Walraevens, assistant officer of the Observatory. From 2 to 4 o'clock, whilst the telegraphic work was at its maximum, these persons communicated with each other with the greatest ease by wires taken at random into the network of telegraphic lines, and whilst these wires continued to transmit telegrams by their ordinary service. Thus, for example, the wire connecting the Observatory of Brussels with its post at Ostend served simultaneously the service of the telemeteorograph, a Morse telegraph, and the telephonic correspondence. Then the wire (No. 2 in the nomenclature of the Belgian State lines, and devoted at present to the service of the Hughes' fast speed telegraph) transmitted duplex telegrams, that is to say, messages which

crossed each other in both directions, of which one set was directed towards Anvers, whilst the others went towards Brussels; and at the same time, by the same wire, conversation was carried on between M. Banneux and the Minister of Public Works.

The Minister expressed his opinion that the correspondence between the two towns was much better than the communications actually exchanged between two offices in the same town. In fact, the voice arrived clear, distinct and powerful. It is important to notice that this triple communication only required a single wire; there was no return wire. M. Olin sent to Mr. Fish, Minister of the United States, as a *souvenir* of the experiments at which he had been present, the ribbon bearing one of the ordinary telegrams received by a Morse instrument at the same moment that Mr. Fish was speaking to M. Banneux, by the same wire. This is the text of the telegram:—"The present Morse despatch is transmitted from Anvers to Brussels by the aid of a wire by which a telephonic conversation is simultaneously carried on by means of the apparatus and arrangements of M. Van Rysselberghe." Similar demonstrations will shortly take place in London.

On the Substitution of Hydrogen Peroxide for Nitric Acid in Galvanic Elements.—By Arthur König.—Landolt has recently proposed to substitute for the nitric acid used in Grove and Bunsen elements, the solution of hydrogen peroxide (otherwise known as hydroxyl or oxygenated water) in water, as it is now industrially prepared and offered for sale. By this change both the corrosive action upon the metallic portions of the battery and the irritation to the lungs of the experimentalist are done away with.

I have examined the electromotive power of such modified elements, which I shall distinguish as Grove-Landolts and Bunsen-Landolts, and have obtained the following results. The solution of hydrogen peroxide employed contained only 2·25 per cent. of the actual peroxide.

The measurement of the electromotive power was executed according to the compensation method proposed by and named after Prof. Du Bois-Reymond.

As a standard unity was employed a Daniell element, in which the zinc was immersed in a concentrated solution of sulphate of zinc, and similar elements were used for compensation.

A Grove element, with nitric acid of specific gravity 1·33, and dilute sulphuric acid containing ten per cent. H_2SO_4, gave immediately, when put together, an electromotive power of 1·74 Dan. After the element had remained open for 20 minutes it fell to 1·72, and after being closed for 50 minutes, without further resistance, to 1·65 Dan. Under similar circumstances a Grove-Landolt element gave the values 1·43, 1·38, and 1·21 Dan. The solution of hydrogen peroxide contained afterwards only 2·16 per cent. H_2O_2. If the solution of hydrogen peroxide was mixed with 1-10th of its volume of sulphuric acid the initial electromotive force was only 1·33. If a saturated solution of common salt was used in place of the dilute acid in which the zinc was plunged the power rose to 1·53 Dan.

A Bunsen element with liquids of similar composition had under the same conditions the electromotive powers 1·67, 1·64, and 1·50 Dan., and after it had remained open for 24 hours, 1·43. A Bunsen-Landolt similarly treated showed 1·41, 1·40, 0·98, and 1·32 Dan. Afterwards the solution contained merely 1·26 per cent. of real hydrogen peroxide. The great decrease of electromotive power after the element had been closed for 50 minutes is here the more remarkable as it did not ensue to the same extent in the Grove-Landolt element. The same considerable falling off of the electromotive power, after having been closed for a length of time, was also observed in a Bunsen-Landolt element in which the solution of hydrogen peroxide had been mixed with 1-10th of its volume of sulphuric acid. Such an element was also something weaker when first put together than one in which the hydrogen peroxide was not acidified. It was also found in this case that the solution, after the element had stood open for 24 hours, contained only 0·70 per cent. of H_2O_2.

Concerning the resistance, I may remark that the Landolt elements without acidulation showed a four or five-fold resistance as compared with Grove and Bunsen elements of the same external form. Acidulation considerably decreases this resistance, but then the evil is encountered that the costly solution of hydrogen peroxide (2s. per lb.) loses its H_2O_2 much more rapidly.

Until the commercial solution of hydrogen peroxide is considerably stronger and cheaper H. Landolt's proposal cannot be recommended in practice.—*Annalen der Physik und Chemie.*

The Electro-Metallurgic Process of MM. Blas and Miest.—The authors have come upon a method for the economical extraction of the precious metals from all sorts of ores of electrolysis. They have established the novel fact that if in electrolysis we substitute for the metal of the anode sulphuretted ores, these latter serve as anodes. Further, if we place such anodes in a bath of a suitable electrolytic salt, and of the same metallic base as the metal of the ore, and allow the electric current to act in such a bath, the result is that all the sulphur of the ore is precipitated upon the anode and falls thence to the bottom of the bath. In the meantime there is formed at the cathode a precipitate or constant deposit of metal liberated from the salt of which the electrolytic bath is formed. On the other hand, the acid of the bath as it is set free approximates an equivalent proportion of the metal contained in the arc. In this manner the neutral electrolytic bath is incessantly reconstituted and serves indefinitely.—*Cosmos les Mondes.*

OFFICIAL RETURNS OF ELECTRIC COMPANIES.

The following returns have been recently filed:—

Anglo-American Brush Electric Light Corporation (Limited).—The second annual return of this company was filed on 10th February. The nominal capital is £800,000, in £10 shares. 40,000 shares had up to the 26th of January been taken up. Upon 13,001 shares the full amount has been called up, and £4 per share upon the remaining 26,999. The total of calls paid is £238,006.

Maxim-Weston Electric Light Company (Limited), formerly the Electric Light and Power Generator Company (Limited).—The second annual return of this company, made up to the 11th of July, was filed on 18th July. The nominal capital is £172,500, in £1 shares, the whole of which have been taken up as follows, viz.:—100,000 by the public; 50,000 (fully paid) by the vendors; 22,500 by patentees. The full amount has been called up. The calls paid amount to £99,997 10s., considered as paid to £72,500, leaving £2 10s. unpaid.

Consolidated Telephone Construction and Maintenance Company (Limited).—The second return of this company, made up to May 8th, was filed on July 27th. The nominal capital is £300,000, in £1 shares. 154,165 ordinary and 45,835 vendors' shares have been taken up. The full amount has been called and paid upon the ordinary shares, and the vendors' shares are considered as fully paid.

Phœnix Electric Light and Power Company (Limited).—The return of this company, made up to September 18th, was filed September 26th. The nominal capital is £250,000, in £1 shares. 58,691 shares have been taken up. Upon 13,661 shares there has been a call of 15s. per share, and upon 30 £1 per share, the remaining 45,000 shares being issued to the vendors as fully paid. The calls paid amount to £8,149 12s. 6d. and unpaid to £2,126 2s. 6d.

Electric Works Company (Limited).—The return of this company, made up to the 12th inst., was filed 14th inst. The nominal capital is £50,000, in £1 shares. 37 shares have been taken up, the full amount being called upon 7, and 5s. per share upon the remaining 30. The calls paid amount to £14 10s.

Jablochkoff Electric Light and Power Company (Limited).—The return of this company, made up to the 29th ult., was filed on 2nd inst. The nominal capital is £300,000, in £5 shares. 18,961 shares have been taken up and £3 10s. per share called thereon. The calls paid amount to £47,194 5s. and unpaid to £19,169 5s.

Stuart Electric Light and Power Company (Limited).—The return of this company, made up to the 2nd inst., was filed on 13th instant. The nominal capital is £60,000, in £2 shares, the whole of which have been taken up and fully paid.

NEW PATENTS—1882.

4845. "Galvano-electric batteries." J. Oliphant and E. B. Burr. Dated October 12.

4869. "Electric lighting." W. Strickland. Dated October 13.

4878. "Galvanic batteries." G. C. V. Holmes and S. H. Emmens. Dated October 13.

4880. "Electric arc lamps." A. M. Clark. (Communicated by W. S. Parker.) Dated October 13.

4883. "Electric lamps." P. R. de Faucheux d'Humy. Dated October 14.

4884. "Systems of electrical distribution and apparatus, or means for regulating the current in such systems." T. J. Handford. (Communicated by T. A. Edison.) Dated October 14.

4889. "Improvements in apparatus for the development of electricity, which improvements consist in a cast helix, or metallic helices, struck in dies from copper, or other metals, or the compounds of metals." J. Whitley. Dated October 14.

4903. "Galleries or brackets for holding globes or lamp-bowls (for electric, gas, or oil lamps) or other fragile articles." C. Ferranti. Dated October 14.

911. "Electric lamps." J. Allmann. (Communicated by L. E. Schwerd and L. Scharnweber.) Dated October 16.

4915. "Switches for electric lamps." T. W. Cowan. Dated October 16.

4919. "Improvements in the means or apparatus for synchronising or controlling standard and other clocks by time signals, and for utilising the time signal wires for telephonic or telegraphic purposes." J. A. Lund. Dated October 16.

4921. "Voltaic batteries." J. L. Henderson. (Communicated by A. Blondin.) Dated October 16.

4928. "An improved dynamo-electric machine." A. C. Elliott. Dated October 17.

4930. "A new or improved electric arc lamp." C. S. Snell. Dated October 17. (*Complete.*)

4931. "Electric motors." A. G. de Neeff and E. Desfossés. Dated October 17.

4971. "Electric alarm apparatus for the detection of burglars and for similar purposes." M. H. Kerner. Dated October 18.

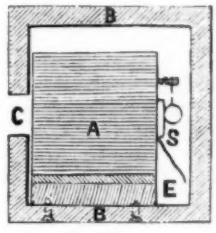
ABSTRACTS OF PUBLISHED SPECIFICATIONS.

1882.

986. "Dynamo-electric machines." W. H. Akester and T. B. Barnes. Dated March 1. 6d. This invention has for its object to increase the efficiency of dynamo-electric machines, and to diminish the cost of their construction. In machines made with the improvements the stationary parts comprising the field-magnets with their exciting electric coils and the pole-pieces may be arranged as in some existing machines, the present invention dealing principally with the rotating parts, or armatures, and the commutators. In one modification there are two compound rotating armatures on one horizontal shaft; and there are two field-magnets which are bars parallel to and on opposite sides of the shaft, and which have pole-pieces at their ends, the northward and southward pole-pieces of one field-magnet being arranged to face the southward and northward pole-pieces of the other field-magnet. One of the compound armatures is between each pair of pole-pieces, the inner faces of which are made cylindrically concave so as to encircle the armatures.

1044. "Telephone transmitters." R. Theiler and M. Theiler. Dated March 4. 6d. This invention relates to the construction of apparatus used for the electrical transmission of articulate speech and known by the name of microphone. Such apparatus invariably consists of two or more conductors of electricity in contact with one another, and to which vibratory motion is imparted by the voice or other source of sound. This vibratory motion of the conductors produces a vibratory current in the circuit connected thereto, and thus the waves of sound are converted into waves of electricity. The novelty of the invention chiefly consists in the means used for communicating the sound vibrations to the conductors, and in the substitution of metallic conductors for the carbon hitherto solely used in apparatus of this kind. The inventors use no tympanum or diaphragm to receive the sound vibrations and communicate them to the conductors, but cause the said vibrations to impinge upon some fibrous or cellular substance, such as cane, whalebone, pith, pine wood, or other material capable of readily transmitting sound. The shape of this substance is immaterial, it is preferred to make it cylindrical or cubical, and to fix it in such a way that the vibrations impinge upon one end or cross cut of the substance while the microphone is attached to the other end or cross cut. By thus substituting a solid block or a bundle of either of the substances named for the tympan or diaphragm used in other transmitters, the inventors attain greater distinctness in the articulation transmitted and by making use of the longitudinal vibrations of a sound conductor instead of the lateral vibrations of a tympan or diaphragm they prevent too violent agitation of the contacts and the breaking of the circuit resulting therefrom. It is not necessary that the said sound-conductor be a fixture, it may be merely suspended. Hitherto only carbon contacts were known to possess the property of varying their conductivity in exact proportion to the amplitude of the vibrations

FIG. 1



imparted to them, and carbon was therefore necessarily used in all successful telephone transmitters. After prolonged researches and experiments the inventors have discovered that metallic contacts made of tellurium, molybdenum or manganese either pure or alloyed with other metals, possess the same property as carbon, and they therefore use any of the named metals or their alloys in the place of carbon for transmitting speech electrically. The figure represents a cubical or cylindrical block of any of the substances just now named, fixed to the case, B, of the transmitter in such a manner that one end or cross-cut thereof faces the aperture, C, while the other end or cross-cut carries the microphone, S. The fine parallel lines represent the fibre or grain of the substance. In order to prevent any but those vibrations which impinge directly upon the said block through the aperture, C, from being communicated to the microphone, S, the inventors insulate the block, A, acoustically from the case, B, by inserting some sheet india-rubber, E, or other suitable material between A and B, as shown. The india-rubber is attached by means of cement to the surfaces with which it is in contact.

1067. "Self-acting block signalling apparatus." Eugène Callot. Dated March 6. 6d. The object of this invention is to produce an apparatus which shall effect the automatic putting on and taking off of the optical discs or signal arms usually employed on railways, in such manner that every train passing over an apparatus of this kind sets behind itself an optical signal placed at the preceding apparatus, which signal shows "danger," or blocks the next following train until the first one has passed over the next apparatus. By means also of this apparatus each train places on the line at a certain distance behind it explosive signals which warn the persons in charge of the next train if from any cause the optical signal has been disregarded. The general arrangement is as follows:—When a railway train passes over the first apparatus a pedal in the latter is pressed down, is held in a given position, and the signal arranged at the departure station is put on. When the train passes the second apparatus its pedal is likewise pressed down, and the signals placed at the first apparatus (the optical and the explosive signals) are brought into the position for covering the said train, whilst the first-mentioned signals are taken off. At the passage of the third apparatus the pressure on its pedals takes off the signals at the first apparatus and puts on those at the second. Thus each train always leaves behind it an optical and an explosive signal at a certain minimum distance according to circumstances, and a train following the first one cannot enter the covered zone without the aforesaid signals informing the persons in charge of such train of the presence of a preceding train.

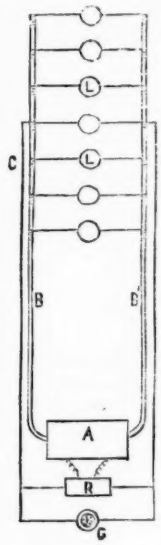
1079. "Incandescent electric lamps." W. Crookes. Dated March 6. 4d. This invention is for improvements in various matters connected with the construction of incandescent lamps. For forming the carbon filaments, the inventor uses, instead of the vegetable matter referred to in former patents, animal fibres, such as silk, hair, wool, silk-worm-gut, or animal matters, such as horn, or gelatine and parchment. These are treated with cuprammonia, and carbonised in the same way as with vegetable fibre, but more slowly, to prevent tumefaction. Some of the above substances are capable of being completely dissolved in cuprammonia, and can then be deposited in a filament in the same way as cotton wool.

1094. "Holders for electric lamps." E. H. Johnson. Dated March 7. 6d. Has for its object the production of a socket or holder for electric lamps, which shall possess the advantages of simplicity in construction (being composed of only a small number of simple parts), non-liability to derangement, and facility for attachment and detachment of the lamp without the aid of any tool or instrument.

1136. "Electric telegraphs." Sydney Pitt. (A communication from abroad by H. C. Mance, of India.) Dated March 8. 4d. The object of the invention is to improve the arrangements for translation of signals automatically between two cables, or between a cable and land line, when relays of an extremely sensitive or unstable character are employed. Although composed more especially to meet the requirements of the Brown-Allan relay, the system can be worked in connection with other relays and telegraph apparatus. The inventor joins up four Morse sounders, or recorders, with clockworks, suitable for double current cable translation, in such manner that notwithstanding the unstability of the relays at the translation office, and the possibility of their coming to rest with the local circuits, some-

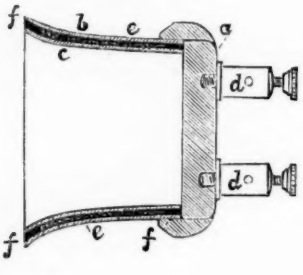
times open, and at other times closed, the distant station on the left is not cut off in the translation apparatus, or prevented from replying when the distant station on the right ceases sending, and *vice versa*. (*Provisional only.*)

1162. "Apparatus for the distribution and regulation of electric currents." W. R. Lake. (A communication from abroad by H. S. Maxim, of America.) Dated March 10. 6d. This invention relates to the distribution and regulation of electric currents supplied from a central or main generating station to devices for utilising the same, as in the deposition of metal, or in the production of heat, light, or power, and it is more especially applicable to systems of lighting in which a large number of incandescent lamps is employed, its object being to maintain a constant ratio between the amount of current generated or thrown into the line and the number of active lamps in circuit. In the figure, A indicates the position of the generator or generators, from which the conductors, B, B^1, extend to a distant group of lamps, L, L. C, C^1, is the regulator circuit, taken off from the main wires at a point as near as practicable to the centre of the group of lamps. The wires of this circuit, C, C^1, are brought



back to the station, where they are connected through the regulator, E, and through a galvanometer, G, which is used in its ordinary capacity to indicate the condition of the line. By these means the regulator, when once adjusted, is controlled entirely by the variations in resistance due to the removal or insertion of the lamps, as, whatever the resistance of the regulating circuit may be, it is affected in the same manner as though it were taken from the main wires close to the generator in cases where the resistance of the main conductors is inappreciable, and in this manner generally when the resistance of the main conductors, intervening between the source of supply and the branches or cross circuits containing the lamps, amounts to an appreciable element of the total resistance of the circuit, the inventor controls the amount of current generated or thrown into the line by means of a regulator included in a branch, or derived circuit, which is taken off from the main conductors at, or near, the centre of the group of lamps, and brought back to the generator.

1177. "Telephones." J. D. Husbands. Dated March 10. 6d. Relates to telephones and is designed to provide for the construction of instruments which shall be as efficient as, and much simpler and cheaper of construction than, any of the telephones now in use. Ac-



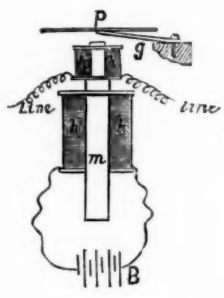
cording to this invention the inventor utilises carbon or other suitable conducting substances in a granulated, crushed, or pulverised condition as a medium for transmitting the sonorous vibrations from the instrument to an electric current in the circuit in which the said instrument is included, and the said invention consists in the combination with suitable chambers or cavities, without a diaphragm, of a tension regulator, consisting of carbon or similar material in the above condition so placed between the electrodes as to microphonically regulate the strength of the current. The figure shows one arrangement of the invention. It consists of a block, *a*, of ebonite, wood, or other suitable insulating or non-conducting material and attached thereto is the mouth-piece which consists of two cylinders, short tubes, or funnels, *b*, *c*, of brass or other suitable material, which form the electrodes or conducting surfaces between which the regulator is placed. These cylinders are of such different diameters that when one is inserted centrally within the other there will be between the electrodes and all around the same an annular space as shown; *d*, *d*, are the terminals for the connection of the telephonic circuit wires. The granulated or pulverised carbon or other material is placed, as shown at *e*, in the said annular space between the two cylinders, *b*, *c*, and the ends thereof are packed with cloth, india-rubber, or other flexible non-conducting material, as shown at *f*, to prevent the displacement of the granulated carbon or other material used as the tension-regulator.

1199. "Electric lamp." Rankin Kennedy. Dated March 13. 6d. Relates to a new or improved electric lamp of the arc type, and consists in making the regulating apparatus of two coils of wire, one fixed and forming a solenoid of thick wire, the other coil being wound on a soft iron tube and of very fine wire. This tube carrying the fine wire coil slides easily inside the solenoid. To the lower end of the iron tube is fixed the upper carbon, a cross-bar carrying two pulleys acting against two guide-rods steadies this carbon and the lower end of the iron tube. The lower carbon is also fixed in a cross-bar running on pulleys on the guide-bars; the upper and lower cross-bars are attached to each other by cords passing over pulleys, so that when the upper carbon rises the lower one falls, and *vice versa*. One of these pulleys has a ratchet and pawl on it, so that it can only rotate in one direction. When current electricity is passed into the lamp, the whole current passes through the thick wire coil and thence through the carbons, this current passing through the thick wire coil acts on the iron tube and draws it up, causing the two carbons to recede from each other. Immediately the carbons begin to recede a part of the current begins to pass through the fine wire coil in such a direction as to cause the iron tube to be repelled downwards, the rising of the tube (and with it the carbon) is thus checked at a certain distance, proportional to the difference between the drawing up power and the repelling power; by this means the space between the two carbon points is always maintained the same. Should the two carbon points come too close, the thick coil becomes most powerful and the tube is drawn up; should the points become too far apart, the coil on the tube becomes most powerful, and it is repelled so that a balance is set up whereby the two carbon points are maintained at a uniform distance apart. The ratchet on the pulley checks its turning to allow the carbons meeting, so that the friction of the cord slipping over it lessens the suddenness of the repelling power. By these means a steady uniform light is kept up between the two carbon points.

1201. "Dynamo-electric or electro-dynamic machines." R. Matthews. Dated March 13. 2d. Has for its object the constructing of dynamo-electric or magneto-electric and electro-dynamic machines in such a manner as to be able to give a continuous electrical current as regards direction, and practically of uniform strength. (*Provisional only.*)

1249. "Armatures for magneto-electric machines, &c." C. L. Levey and E. Lumley. Dated March 15. 6d. Relates partly to the construction of armatures for magneto-electric machines, and particularly to that class known as "ring" or "Gramme" armatures; and this part of the said invention has for its objects the simplification of construction, accuracy and facility in securing the supporting shaft concentrically therein, the winding of the induced conductor in uniform and equal sections or bobbins, and the dissipation of heat by conduction and radiation.

2259. "Apparatus for the transmission, &c., of sounds by electricity." W. C. Barney. One part of the invention relates (according to the inventor) to improvements of an instrument for the reproduction of sound invented by Philipp Reis. One form of the improved instrument is made in the following manner—On a straight bar, *m*, of soft iron is placed a helix, *h*, the covered wire wound thereon being in the circuit of a battery, B, with a second helix, h^1, placed on the end of the bar, *m*, the covered wire wound



thereon being in the main line circuit. One extremity of a steel spring, *g*, is firmly secured to the casing of the electro-magnet, *m*, the other extremity thereof extends over, close to, but not in contact with, the end of the core in the helix, h^1, and against this end of the spring, *g*, is firmly held a plate, *p*, at right angles to the axis of the helix; this plate may be made of cardboard cork, wood, glass, brass, mica, iron, or steel, or of any equivalent material which may, or

may not, be capable of inductive action, and the plate may be round, oval, oblong, triangular, or rectangular, and it must be clamped firmly around its edges, sides, or points, between parts of the casing of the electro magnet.

2531. "Armatures for electric machines." W. R. Lake. (A communication from abroad by J. J. Wood, of Brooklyn, America.) Dated May 27. 6d. Has for its object to secure the annular core portion or armature proper to its hub or shaft in a positive and rigid manner in its direction of rotation, so as to obviate the displacement of the armature or its coils by the strains to which it is subjected when in use.

2563. "Electric lamps or lighting apparatus." W. R. Lake. (A communication from abroad by J. J. Wood, of Brooklyn, New York.) Dated May 31. 6d. Relates to arc lamps and to devices for cutting a faulty lamp out of circuit when its arc fails, or when the arc becomes abnormally long by failure of the feeding mechanism or by other causes.

2570. "Electric lamps." W. R. Lake. (A communication from abroad by J. J. Wood, of New York, America.) Dated May 31. 6d. Relates to that class of arc-lamps known as "double or duplex" lamps, which are provided with two or more sets of carbons and corresponding holders, the second set of which is thrown into luminous action as soon as the first set is exhausted, whereby the light of the lamp is continued, without interruption or attendance, over a longer period. The object of the present improvements is to provide a simple and efficient apparatus of this character which will embody two or more sets of carbons in such a way that one set only will be in action at one time, and the strain of one only will be borne by the regulating mechanism and its magnets or other motor, so that such mechanism and motor shall have only the same work to perform as it has in an ordinary single lamp, and will require no increased dimensions, power, or consumption of current, as is the case with duplex lamps, heretofore produced, in which the strain of both carbons is constantly borne by the magnet, and both are moved at the same time, one slightly in advance of the other.

2623. "Devices for coupling the armatures and commutators of electric machines." W. R. Lake. (A communication from abroad by J. J. Wood, of Brooklyn, New York). Dated June 3. 6d. Relates more especially to the Gramme form of armature and commutator, and it consists in an improved device for connecting or coupling the ends of the armature coils with the commutator strips or sections.

DISCLAIMER.

2909***. 1877. "Controlling by sound the transmission of electric currents and the reproduction of corresponding sounds at a distance." The United Telephone Company's disclaimer and memorandum of alteration. Edison's patent.

CITY NOTES, REPORTS, MEETINGS, &c.

THE ELECTRIC NEWS-TELEGRAPH COMPANY (LIMITED).

Under the presidency of Sir Michael Kennedy, the statutory meeting of the shareholders of the above-named company was held on the 13th inst., at Cannon Street Hotel.

Mr. John Cooper, secretary, having read the notice convening the meeting,

The Chairman said: Gentlemen, this is our first general meeting, called merely in compliance with the statute, therefore we shall not have very much to tell you on this occasion. I have just thrown together a few remarks, which I will read to you. The company was incorporated on the 5th of June. The total number of shares issued was 7,805, representing a nominal capital of £39,025. The amounts due on application and allotment, and on first call, have been all received, with the exception of a small sum which is now in process of adjustment. The terms of payment to the vendors were altered from those stated in the prospectus of the company, by the reduction of the cash payment from £23,500 to £6,000, and £3,000 in debentures, and by a corresponding increase in fully paid-up shares. When the company's prospectus was issued, an opposition of a most determined and virulent character was offered by the Exchange Telegraph Company, who went to great expense in advertising a statement calculated to damage the company's prospects in obtaining capital. They stated that the Exchange Telegraph Company could use the instrument of this company, which they alleged to be an infringement of their patents; and it became necessary to issue a counter-statement to show that those claims were unfounded. Although there was no doubt on the subject, it was thought advisable, as this statement had been made, before proceeding to allotment to have further expert opinion on this point, and the matter was submitted to an eminent electrician, Professor F. Jenkin, who reported as follows:—

"6, Duke Street, Adelphi, London, W.C.,
"*July 14th*, 1882.

"Sir,—In answer to your request that I should advise your board concerning an advertisement which appeared in *The Times* of 30th June, headed, 'The Exchange Telegraph Company,' I have now the honour to report as follows:—

"I have looked through five patents which I am informed belong to the Exchange Telegraph Company.*

"I have also looked through two patents which I am informed belong to the Electric News-Telegraph Company; these are No. 5,162 of 1880 and No. 1,853 of 1882.

"I have seen the two instruments of the Electric News-Telegraph Company constructed in accordance with the last-mentioned specifications. Both are good instruments, and I consider the later form, which is made in strict accordance with specification No. 1,853 of 1882, to be an improvement on the earlier form. The new instrument is, in my opinion, excellent and especially adapted for use where, as in your business, many instruments are placed in one circuit.

"In the advertisement referred to above a specific allegation is made that the Exchange Company are entitled to use under their patents everything contained in your instruments. In answer to this it is only necessary to say that the instruments which you use are made in strict accordance with the specifications of your patents. These patents are in force and must be proved invalid before your instruments can be used by others.

"Under the fifth head in the above-named advertisement two statements are made—First, That the 'peculiar self-adjusting appliance' used in your later instruments is not identical with that used in the earlier instruments; this may be true, but it is irrelevant, as no assertion of identity was made by you. The second statement affirms that your new self-adjusting appliance is the subject of a patent belonging to the Exchange Telegraph Company.

"In reading the patents belonging to the Exchange Telegraph Company, I attended specially to this point, and I am clearly of opinion that these patents give them no claim which can interfere with your new 'self-adjusting appliance.'

"Under the sixth head of the above-named advertisement, it is stated that the directors of the Exchange Company consider it an error to say that the whole of the varied movements of your instrument are regulated by a single wire. There was no error in your statement, your instruments are worked and regulated through one wire, and this fact gives your instruments an important advantage over others.

"I am, Sir,
"Your obedient servant,
"FLEEMING JENKIN, F.R.S., &c.

"W. J. Burnside, Esq.,
"Managing Director, Electric News-Telegraph Company.

"*P.S.—The patents I have examined of the Exchange Company are 1,657 of 1870, 1,400 of 1871, 2,576 of 1873, 1,475 of 1877, 4,628 of 1880."

It was a matter of great regret that the Exchange Telegraph Company should think it fit to adopt the tactics they did, and should have endeavoured to crush this company at its birth by measures which could hardly be considered fair or justifiable. It was no subject for surprise that they should have felt the danger of the rivalry about to spring up; and the fear of the effect of the establishment of a better, a newer, and a cheaper instrument on the monopoly they had so long enjoyed. Their efforts to crush the company were, however, unavailable; sufficient money was subscribed, and the manifestation of feeling the Exchange Company gave to the new competition is one of the best proofs of the merits of the invention of the company. This company was established to take over a young, but growing concern. At the time we took it there were only 82 subscribers, with an annual income of, say, £2,370; there are now 118 subscribers, paying annually a sum of, say, £4,660, an increase of more than 50 per cent. in about four months. And the business is still steadily increasing, notwithstanding the fact that since the commencement of the company's operations it has been the slack period of the year, during which it is not to be expected that the same amount of business can be done as we may confidently look forward to at the more busy period. The outgoings of the company are at the rate of, say, £5,000 per annum; so that there is already nearly an equilibrium between outlay and receipts, and as preliminary and many general charges are provided for, fresh subscriptions will go to profit; and I think as regards our home business our prospects are very encouraging. We are now in negotiations for the sale of our patent rights out of England. These negotiations, though in a very advanced stage, have not been finally concluded. I hope we shall shortly be in possession of results very favourable to this company. For obvious reasons, it will not be well for me to enter into details on this subject, and I am sure you will see this. Your directors have your interest entirely at heart, and with the assistance of your able and energetic managing director, Mr. W. J. Burnside, will do all in their power to secure those interests.

Mr. Keen: I hope there is no fear of litigation with the rival company?

The Chairman: I don't think so. We have had no indication of anything of the sort, or anything on their part to oppose us, or they would have done so before now. I think they have no chance of succeeding in any attempt they may make in that direction.

A Director: We hope it may be the other way on.

The Chairman: If no other gentleman has any question to ask we will consider the proceedings have terminated.

Mr. Hunt proposed a vote of thanks to the Chairman, which was seconded by Mr. Keen, and

The Chairman in reply remarked that his own opinion certainly was that the undertaking would prove a very successful affair, and they could already see indications of that.

THE WEST COAST OF AMERICA TELEGRAPH COMPANY (LIMITED).

The report of the directors states that the accounts for the year ending 31st December, 1881, show the gross revenue to be £32,356 15s. 11d. against the sum of £17,398 14s. 2d. for the previous year, leaving a net balance of profit of £1,308 13s. 6d.—a result which may be looked upon as satisfactory, regard being had to the continuance of the deplorable war between Chili and Peru; and considering that the company's terminal station at Lima was only open for traffic for half of the year, whilst Mollendo, another of the company's stations, was blockaded by the Chilian fleet during the whole of the year. Not-

withstanding, however, the continuance of active hostilities and the utter stagnation of trade at Lima, and at other places on the west coast, the board are glad to report that the income of the company continues to increase, and that the next balance sheet of the company, which will be issued at an earlier date, will show a considerable improvement in its position and prospects. The interest upon the debentures of the company has all been paid and the amounts included in the balance sheet in the item £8,299 15s. 8d. "Outstandings due by company" have been paid also. The expenditure of the repairing steamer *Retriever* shows a sensible decrease, whilst her earnings show a material increase of £2,286 6s. 10d. For the current year she has been employed in assisting to lay the new cables on the Pacific coast, and has earned up to this time £6,900, an amount considerably in excess of her earnings for the corresponding period of last year. The net increase in the income of the company for the present current year amounts, so far as it has already been ascertained, to a sum of about £7,000. The board regret that despite their anxious and unceasing efforts they cannot as yet announce a settlement of the company's claim upon the Chilian Government. It is not advisable at the moment to enter into details, but it may be stated that, yielding to the influences brought to bear by the board, the Chilian Government not only assented to the appointment of arbitrators in the matter, but it has in a sense anticipated their decision by offering a sum of money in settlement of part of the claim, leaving the other part to be prosecuted hereafter. This offer the board have declined, and instructions have been sent out to the coast for the claim to be urged and pressed forward in every way compatible with the interests of the company, and with the present difficult position of the Chilian Government. Regarding the prospects of the company, the board are pleased to announce to the shareholders that the new cables of the Central and South American Telegraph Company, extending for some 3,000 miles along the Pacific coast, have been opened for public traffic this week. These cables, completing the circle of the South American Continent, give this company a new route, and establish direct communication from Valparaiso to the whole of the Central American Republics, to the United States, and to England. Agreements have been completed by the board with the Central and South American Telegraph Company and with the Mexican Telegraph Company, for the transmission and exchange of the traffic which this company will obtain through the opening of these new and extensive lines. With a cessation of hostilities, and anything like a revival of trade upon the coast, these lines should bring a marked accession to the business of the company. The board regret to report the untimely death of Mr. Rose-Innes immediately after his return from the west coast, where for some months he had rendered valuable service in looking after and promoting the interests of the company. The members of the board retiring by rotation are Mr. Matthew Gray and Mr. Robinson Kendal, both of whom being eligible, offer themselves for re-election. The vacancy caused by the death of Mr. Rose-Innes the board do not propose to fill up at the moment.

Annexed to the above report is a list of the cables and land lines of the company with their lengths in nautical miles. Cables.—Valparaiso to Serena, 219·03; Serena to Caldera, 215·34; Caldera to Antofagasta, 229·00; Antofagasta to Iquique, 250·50; Iquique to Arica, 128·35; Arica to Mollendo, 146·42; Mollendo to Chorrillos, 510·08. Land-lines.—Chorrillos to Lima, 11·00; Lima to Callao, 7·00. Total, 1716·72.

THE BRAZILIAN SUBMARINE TELEGRAPH COMPANY (LIMITED).

The report of the directors, to be presented to the eighteenth half-yearly general meeting, states that the revenue for the half-year ended 30th June, 1882, amounted to £88,842 3s. 3d.; and the working expenses (including £10,609 7s. 11d. for repairs of cable) to £23,155 12s. 6d. After providing £1,101 18s. 6d. for income-tax there remains a balance of £64,584 12s. 3d.; to this is added £38,710 12s. 1d., the undivided profits to 31st December last, making a total of £103,295 4s. 4d. From this amount there is deducted £19,500, the third interim dividend paid 24th June last, and £50,000 transferred to the reserve fund, leaving a balance of £33,795 4s. 4d. The directors now recommend the declaration of a final dividend of 3s. per share, making a total dividend of 6 per cent. for the year ended 30th June, 1882, and also the payment of a bonus of 2s. per share, both free of income-tax, which together will amount to £32,500, being a distribution in the aggregate of 7 per cent. for the past year, leaving a balance of £1,295 4s. 3d., to be carried forward. Early in May last another fault occurred in the shore end at Pernambuco, which developed to such an extent as to cause a total interruption before the end of the month. A temporary repair was promptly effected by the company's superintendent, Mr. Howe, and at the end of June the s.s. *Kangaroo* laid a new shore end, bringing the electrical condition of the cable to the same state of perfection as when first laid. Since the last general meeting a serious fault has developed in the Lisbon-Madeira section, in consequence of which the directors have thought it desirable to make an agreement with the Telegraph Construction and Maintenance Company for the manufacture and laying of a duplicate cable for that section at a cost of £100,000, which will be taken from the reserve fund. The directors regret to announce the recent death of their colleague, Mr. Matthew Hutton Chaytor. The directors have, under the powers given them by the articles of association, elected the Hon. William St. John F. Brodrick, M.P., to fill the vacancy occasioned by the death of Mr. Chaytor. Two of the directors, Mr. C. F. dos Santos Silva and Mr. Frederick Youle, retire by rotation at this meeting, but being eligible for re-election, they offer themselves accordingly.

Messrs. Ferranti, Thompson and Ince (Limited), notify that they have removed from 110, Cannon Street, to 3, Fenchurch Avenue.

Cable Repaired.—The cable between Guadaloupe and Dominica has been repaired. Communication with the islands of Dominica and Martinique is therefore restored.

The Direct Spanish Telegraph Company (Limited).—We are informed that this company's rate to Valparaiso and other stations in Chili has been reduced from £1. 4s. to 14s. 8d. per word.

Mr. John Pender sailed from the United States for Europe on the 17th inst., in the steamer *Alaska*. It is reported that a hitch has occurred in the negotiations with Mr. Gould. The Western Union, being satisfied with the recent contract for an exclusive interchange of business with all existing cables, is unwilling to modify or permit the cables to receive business from other sources. Mr. Pender's object, it is supposed, is to prevent the laying of the cable projected by Garrett, the president of the Baltimore and Ohio Railway, connecting with the Mutual Union Telegraph. He declined the proposed directorship of the Western Union Telegraph Company.

Application has been made to the Stock Exchange Committee to appoint a special settling day in the shares of the Birmingham and Warwickshire Brush Electric Light and Power Company (Limited); also in the shares of the Devon and Cornwall Electric Light and Power Company (Limited), and to allow the following to be quoted in the official list:—Gülcher Electric Light and Power Company (Limited) shares. The Committee have appointed Tuesday, the 24th inst., a special settling day in the Anglo-Austrian Brush Electrical Company (Limited) shares.

QUOTATIONS.

Authorised Issue.	Share.	Name.	Paid.	Closing Quotations. Oct. 18.	Business Done.
		ELECTRIC LIGHT.			
40,000	10	Anglo-American Brush Co.	4	12¼-13¼	13⅛-⅜-½ 12 1/16-13.12 5/16 ⅜-½-13.12 5/16
		Do. Do.	10	25 - 29	
30,000	5	Australasian Electric Light, Power & Storage Co.	3	1⅛- 2	1⅛
24,900	10	British Insulite Co., Limited, "A" Shares	5	4⅛- 5	
30,000	5	Brush Electric Light & Power Co. (Scotland)	2½	1⅛- 1⅛	
25,000	5	Great Western Electric Light & Power Co.	2½	1 - 1⅛	
24,980	5	Hammond Electric Light & Power Supply Co.	2½	7⅛-7½	7⅛
40,000	5	Indian & Oriental Electrical Storage Works Co.	2	1⅛- 1⅜	
172,500	1	Maxim-Weston Electric Light and Power Co.	1	⅝- ¾	
40,000	5	Pilsen-Joel & General Electric Light Co.	2	1⅛- 2	1⅝
..	..	South African Brush Electric Light & Power Co.	2½	.. ..	
100,000	5	Swan United Electric Light Co., Limited	2	2 - 2⅛	2⅛
		TELEGRAPHS.			
2,116,400*l.*	Stk.	Anglo-American, Limited	100	50 - 51	58⅜ xd.
2,441,800*l.*	Stk.	Do. Preferred Def'd. receiving no div. until	100	82 - 83	82½ xd.
2,441,800*l.*	Stk.	Do. Deferred 6 p. c. has been paid to Pref.	100	20 - 21	20½
130,000	10	Brazilian Submarine, Limited	10	12¼-12⅜	12⅜-⅞
16,000	10	Cuba, Limited	10	9⅜- 10⅛	
6,000	10	Do. 10 per cent. Preference	10	16 - 17	
13,000	10	Direct Spanish, Limited	9	6 - 6⅛	xd.
6,000	10	Do. 10 per cent. Preference	10	15 - 16	15⅛ xd.
65,000	20	Direct United States Cable, Limited, 1877	20	11⅜- 12⅛	12⅛-⅜
100,000*l.*	100	Do. 6 per cent. Debenture, repayable 1884	100	100 -103	xd.
380,000	10	Eastern, Limited	10	10⅛- 10⅝	10⅜-⅝ xd.
70,000	10	Do. 6 per cent. Preference	10	12⅛- 13	12⅛-⅝ xd.
232,000*l.*	100	Do. 6 do. Debentures, repayable Oct. 1883	100	100 -103	xd.
200,000*l.*	100	Do. 5 do. do. Aug. 1887	100	101 -104	
200,000*l.*	100	Do. 5 do. do. Aug. 1899	100	101 -104	
199,750	19	Eastern Extension, Australasia & China, Limited	10	11⅜- 11⅝	11 5/16-⅜-⅝ xd.
320,000	100	Do. 6 p. c. Debentures, repayable Feb. 1891	100	107 -110	
500,000	100	Do. 5 p. c. (Australian Gov. Subsidy) Deb. 1900	100	102 -105	
140,000	100	Do. do. registered, repayable 1900	100	102 -105	
100,000*l.*	100	Do. 5 per cent. Debenture, 1890	100	103 -106	
254,300*l.*	100	Eastern and South African Limited 5 per cent. Mort. Deb. Registered redeemable 1 Jan. 1900	100	102 -105	
345,700*l.*	100	Do. do. do. To Bearer	100	102 -105	
22,050	10	German Union Telegraph and Trust, Limited	10	9⅜- 10½	
163,390	10	Globe Telegraph and Trust, Limited	10	6⅛- 6⅜	6⅛-⅜-⅛
163,209	10	Do. 6 per cent. Preference	10	12⅛- 12⅜	
125,000	10	Great Northern	10	12⅛- 12⅜	
100,000*l.*	100	Do. 5 per cent. Debentures	100	100 -103	101
31,200	10	India-Rubber, Gutta-Percha and Telegraph Works	10	27 - 28	
100,000	100	Do. 6 per cent. Debentures, 1886	100	100 -103	
17,000	25	Indo-European, Limited	25	31 - 32	31½
38,148	10	London Platino-Brazilian, Limited	10	4⅛- 4⅜	4⅜
12,000	10	Mediterranean Extension, Limited	10	2⅛- 2⅜	
8,200	10	Do. 8 per cent. Preference	10	8 - 9	
9,000	8	Reuter's, Limited	8	12⅛- 13	xd.
280,000	Stk.	Submarine	100	250 -260	
58,225	1	Do. Scrip	1	2⅜- 2⅝	2 5/16-½
4,200	Cert.	Submarine Cables Trust	100	102 -106	101 xd
37,350	12	Telegraph Construction and Maintenance	12	30½- 31½	
150,000	100	Do. 6 per cent. Bonds, 1884	100	101 -104	
186,750	5	Do. 2nd Bonus Trust Cert.	5	1⅛- 1⅜	
30,000	10	West Coast of America, Limited	10	4⅜- 5⅛	
150,000	100	Do. 8 per cent. Debentures	..	.. ..	
69,910	20	Western and Brazilian, Limited	20	6⅝- 7⅜	
200,000*l.*	100	Do. 6 per cent. Debentures "A" 1910	100	104 -107	
2,500	100	Do. 6 p.c. Mort. Deb. series B of '80. red. Feb., 1910	100	97 -100	
1,500	$1,000	Western Union of U. S. 7 p.c. 1 Mort. (Building) Bds.	$1,000	123 -128	124
1,030,000*l.*	100	Do. 6 per cent. Sterling Bonds	100	100 -103	
88,321	10	West India and Panama, Limited	10	1⅜- 1⅝	1½-⅝
34,563	10	Do. 6 per cent. 1st Preference	10	7 - 7⅛	7⅛-⅛-7.6⅝
4,669	10	Do. 6 do. 2nd do.	10	5⅛- 6	6
		TELEPHONES.			
154,165	1	Con. Telephone & Maintenance, Ld. Nos. 1 to 154,165	1	1 - 1⅛	1 1/16
200,000	1	Oriental Telephone Co., Nos. 100,000 to 300,000	½	⅜- 1	⅝
100,000	5	United Telephone Co.	5	10⅜- 11⅛	